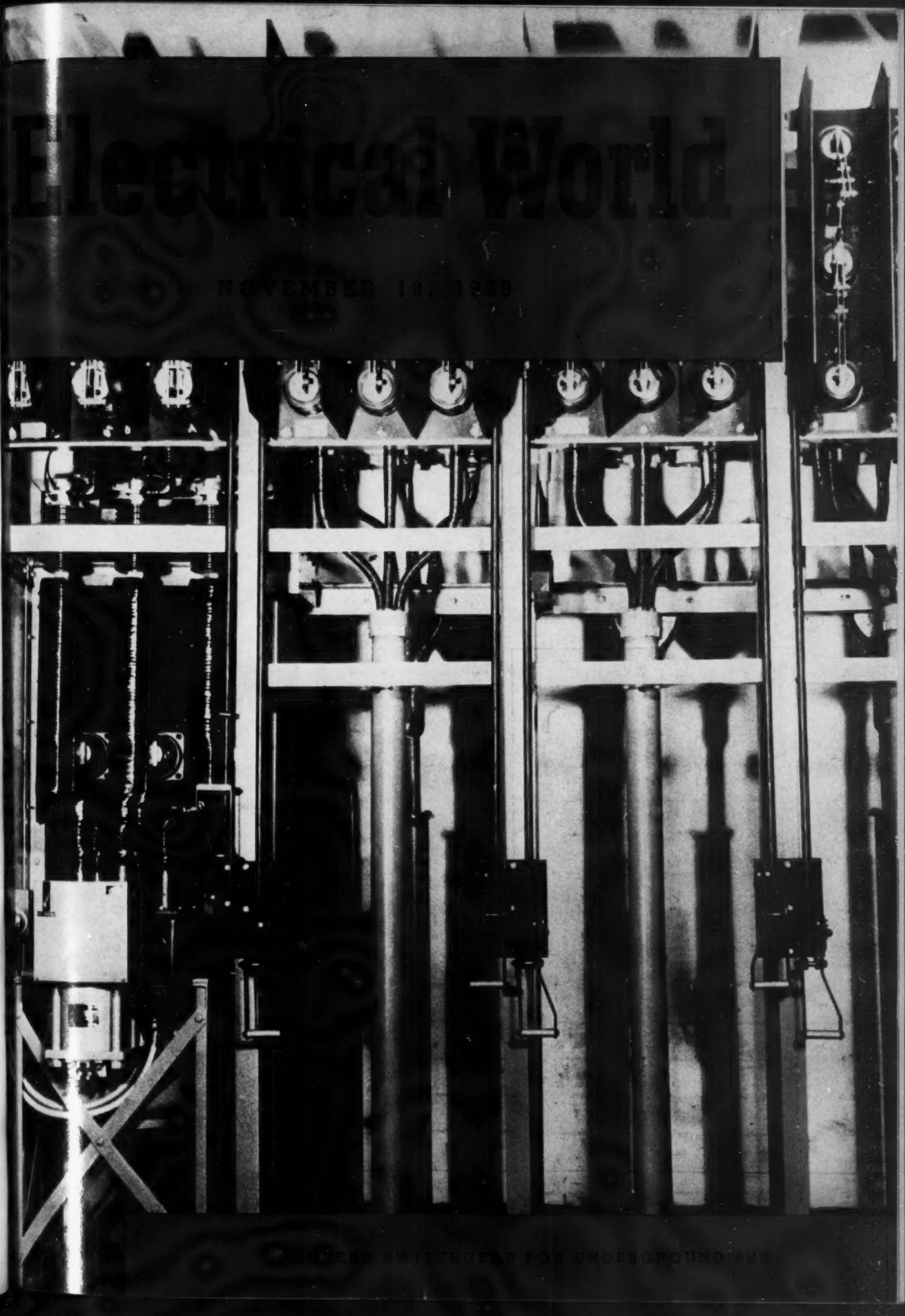
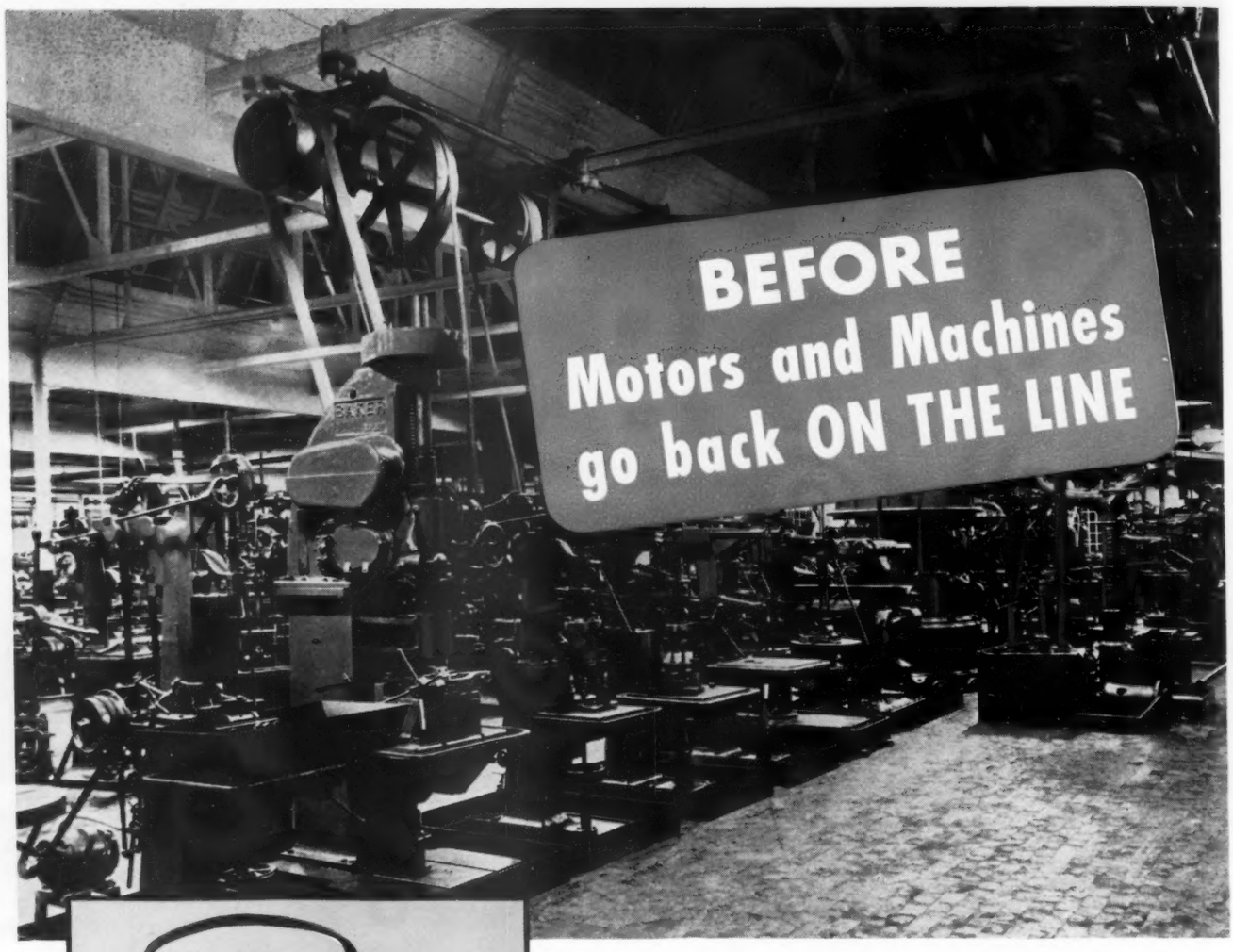
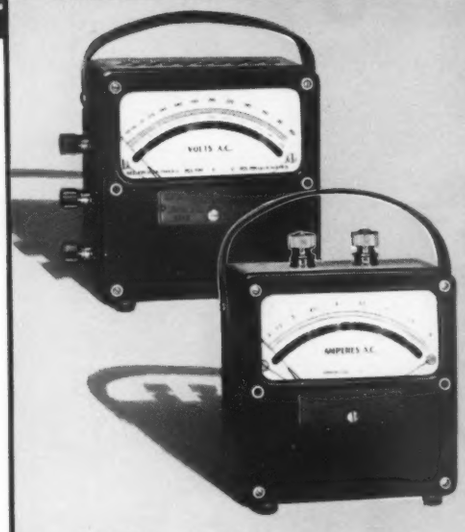
Electrical World

NOVEMBER 18, 1939



SWITCHGEAR FOR UNDERGROUND AUS





The WESTON 430 line possesses *every* qualification for efficient maintenance ... *compactness—ruggedness—dependable accuracy—wide, legible scales*— and *low cost*. Available in AC and DC. Literature is available giving complete details on these and other WESTON maintenance instruments ... as well as on instruments for use in product assembly and inspection. Copies gladly sent on request.

A THOROUGH *ELECTRICAL* CHECK IS *VITAL!*

If the equipment has been idle ... it needs more than *just cleaning and oiling!* » » » Shafts or gears may be out of alignment ... belts may be too loose or too tight ... moisture or dirt may have affected windings, contacts or brushes. » » » *All* are potential sources of maintenance trouble ... sure sources of power waste. *All* are invisible to the eye ... but instantly revealed by the pointer of a dependable electrical instrument. » » » Before any motor or machine goes back "on the line", check it thoroughly with a WESTON portable. The instruments illustrated are designed *exactly* for this service. And *periodic* checks ... requiring but little time and effort ... will insure *continuous* efficient functioning of all your electrified equipment. Weston Electrical Instrument Corp., 578 Frelinghuysen Ave., Newark, N. J.

WESTON
Instruments

Too Much Distrust

Why is there so much mutual distrust throughout the electrical industry? In an industry that is so interdependent is it not strange that there is not a more sympathetic understanding of each other's problems and an eagerness to be mutually helpful?

Let the utilities suggest any changes in the National Electrical Code, or let them start to explore the possibilities in a new appliance design to meet the low-income market, and at once opposition springs up from the other interested branches.

Manufacturers in developing a marketing program have on more than one occasion met with all sorts of obstacles from the utilities.

Contractors are looked down upon by every other branch of the industry. Their co-operation is solicited in a rather perfunctory way and given in considerably lesser degree.

Labor, having been left to its own devices, is at cross-purposes with utilities and manufacturers—the only interests that can improve employment. It plays along with the contractors when and if it gets what it wants.

What a sad state of affairs for an industry that needs all of its resources pulling together to create more business and more employment! Why cannot the utilities see that their strongest bulwark against political agitators is the rest of the electrical industry? Why cannot these others see that their greatest opportunity for business and employment comes from privately operated utility service free to expand without fear?

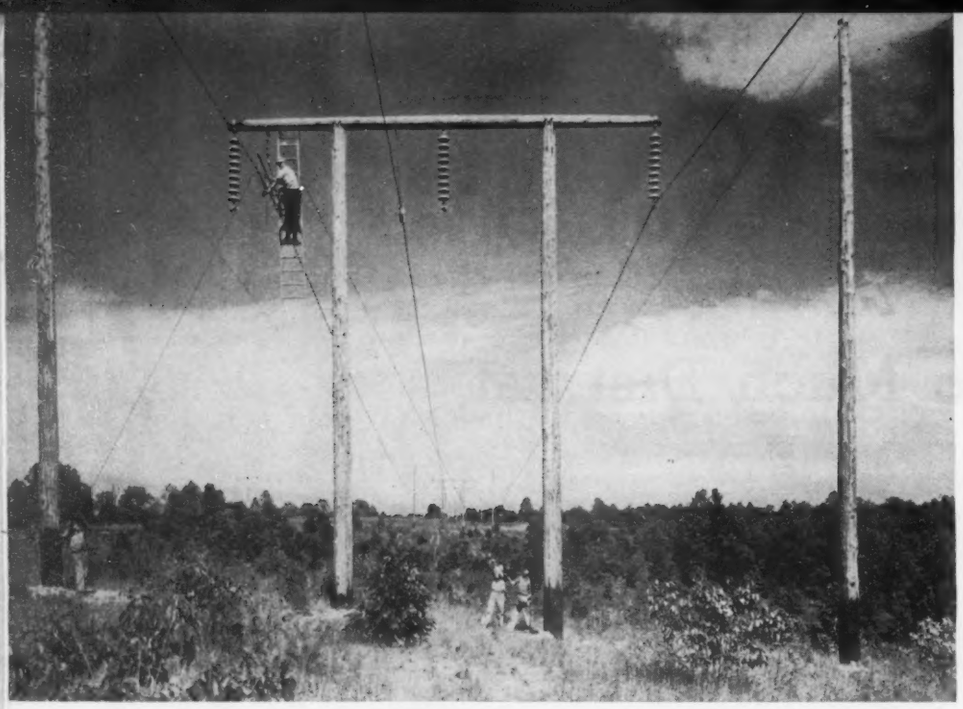
There is too much of the negative approach to all suggestions by others. Instead of looking for the "nigger in the wood pile," it's high time the industry began to take the positive approach and look for ways to get things done.

Also, there is too little effort made by the different branches of the industry to know and understand each other. There have beeen spasmodic attempts to create a better understanding of our interdependence, but somehow or other few of the executives who could have made industry history have been interested.

No one knows better than we do that there are too many associations in the electrical industry; we have to attend so many meetings. Nevertheless, it is our firm belief that somewhere there should be set up an organization that represents not just manufacturers, or utilities, or contractors, etc., but the *electrical industry*.

Instead of having the Edison Electric Institute or NEMA or some other group sponsor some marketing program, the industry could be the godfather. Such an industry organization could provide the means for ironing out differences of opinion on major matters. And, finally, it could be the guide and mentor for the local electrical leagues.

Jealousy, bickering, mistrust, hatred, aloofness have no piace in a program of progress. We have a big job ahead of us to serve America with more electrical service at less cost, and without government interference. This is not the job of any one part of the industry alone; it is a job for all, working together. There's opportunity, profit and employment in working together. On the other hand, if we each insist on going our own sweet way we can rest assured that we will get no further than the tides of other business will take us.



Linemen tie in conductors on suspension frame

Perfect Lightning Record on 154-Kv. Spar-Arm Line

Three-season performance of wood-pole line shows no outages attributable to lightning flashovers on the 96 miles of unique H-frame construction

LLEWELLYN EVANS, *Chief Consulting Electrical Engineer, Tennessee Valley Authority, Knoxville*

H. C. DANIELS, *Assistant Consulting Engineer, Chase Brass & Copper Co., Waterbury, Conn.*

ABSENCE of any lightning outages attests to the success of the design of the 154-kv. wood-pole transmission line which was described by the present authors in the ELECTRICAL WORLD, issues of April 11 and November 6, 1936. The line, built entirely of butt-treated Western red cedar poles with round spar crossarms of the same material, was hoped to be practically "lightning-proof."

On the H-frames supporting the conductors there are no other wires and grounding wires. Lightning diverter wires on each side of the line are supported on separate poles set 14 ft. from the outer conductors. There are nine insulators in suspension strings and eleven in dead-end strings. The results of three years operation in an exceedingly severe lightning area are now history on this line and the absence of any lightning outages attests to the success of the design. The entire line is 232 miles long, 96 miles of wood pole H-frames in series with 136 miles of steel tower construction, and extends from Wilson Dam to Norris Dam in the Tennessee Valley.

From August, 1936, when the line went into service, through May, 1939, there were a total of seven outages on the line, one in May, 1937, and two each in March and May, 1938; one in April, 1939, and one in June, 1939. All lightning outages have been traced to other sections of the line, except the last two, which occurred in storms on other sections, leaving the wood-pole section with a perfect lightning record. That the line

Many Lightning Outages on Neighboring Lines, but None on Wood Line

From	To	Voltage	Length, Miles	Lightning Outages January, 1937, to August, 1938, Inc. 20 mos.	Per 100 Miles per Year
Wheeler Dam—	Norris Dam				
	Wood Section	154 kv.	96	0	0
	Steel Section	154 kv.	136	5*	2.2
Hobgood—	Moulton	44 kv.	25.6	13	30.5
Decatur—	Athens	44 kv.	24	16	40.0
Athens—	Columbia	44 kv.	60	52	52.0
Wilson—	Wheeler	44 kv.	15.7	13	49.7
Watts Bar—	Friendship	44 kv.	50	20	24.0
Lincoln County		12 kv.	770	861	67.1
Cumberland County		12 kv.	60	339	339.0

*Limited clearance of a jumper on a transportation tower accounted for two of these outages. Two additional trip-outs, one in April, 1939, and one in June, 1939, have not been accounted for except that they occurred during storms.

has had no dearth of exposure to lighning is shown by the outage record of lower voltage lines in its immediate vicinity, both paralleling and crossing the 154-kv. line. The comparative record is given in the accompanying table.

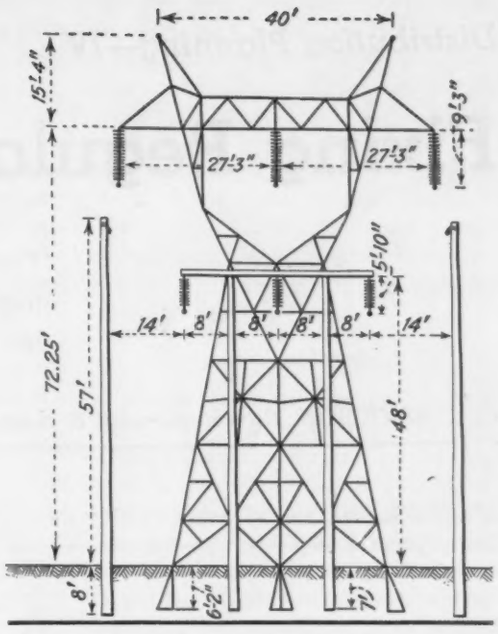
All of the outages listed have been ascribed to lightning except on the 12-kv. lines, where lightning and all outages of unknown cause are included.

A perfect record in the face of severe lightning exposure, even for the relatively short period of three lightning seasons, has given rise to much conjecture on the performance of this line. The design was calculated to withstand 20,000-kv. direct strokes to the ground wires without flashover from conductor to ground when footing resistance was 10 ohms or less. Actually, the footing resistance is much higher, a recent check showing an average of about 45 ohms with the ground wires connected.

It has been suggested that the separately supported ground wires with no ground whatever on the conductor supports turns a high ground resistance from a liability into an asset. However, the fact remains that there is only an air gap (13.5 ft. with insulators vertical) between the conductors and ground wire down leads, which flashed over at 2,635 kv. on laboratory tests. It was thought that possibly flashovers direct from conductors to down leads might have occurred without power follow-up or breaker operation. Such opinion was substantiated by the original laboratory tests in which the arc-overs were more in the nature of corona streamers than power arcs. Such discharges usually ripped splinters from the poles and crossarms and in case of power follow-up the down leads (No. 4 steel wire) might be expected to become hot enough to char the ground wire poles. A pole-by-pole inspection over a large part of the line failed to disclose any signs of flash-over.

It is quite possible that arc-overs to the ground wires have occurred without leaving visible evidence and without relay operations. This probability was indicated by the laboratory tests and would be in line with expectations. The resistance of the path from conductors to ground is so high that apparently if flashovers have occurred, the line voltage is insufficient to maintain the arc long enough to affect the power circuit. So far this line has been immune even to "hot" lightning.

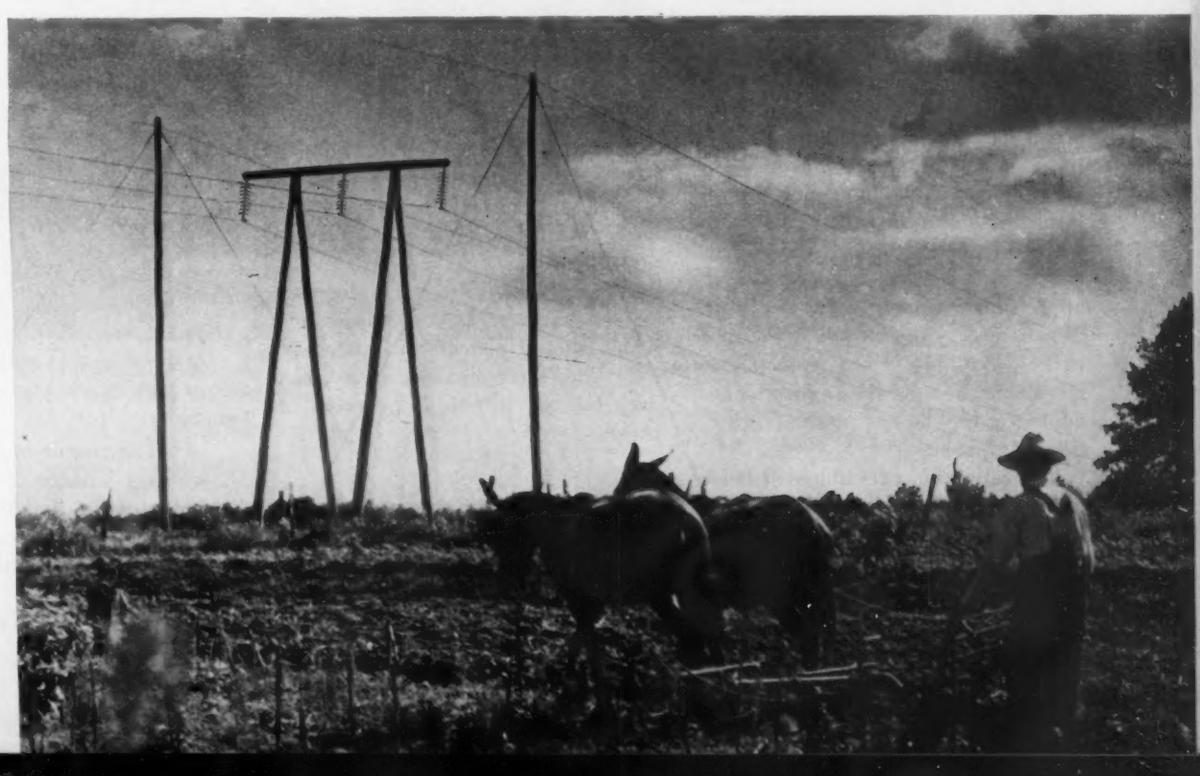
Based on design calculations, parallel ground counterpoises were thought to be necessary, at least on exposed parts of the line, to obtain full lightning protection. Three years of uninterrupted performance have failed to disclose any weak points and any thought of additional protection has now been abandoned.



Wilson-Norris wood line contrasted with equivalent steel structure

"The steel equivalent estimated at present prices to cost 24 per cent more than this spar-arm wood line."

Some engineers may think the additional poles used in this construction would result in an overly expensive line. Actually, its cost probably does not exceed by more than 10 to 15 per cent that of the cheapest possible construction and is very likely less than that of equivalent lines built for first-class performance. The steel equivalent of this line is estimated at present prices to cost 24 per cent more than this spar-arm wood line. The hardware for the spar arms cost less than conventional hardware for double plank arms.



Dead-end structure devised to avoid use of ground guys. Bottom of each pole has a cross-member to prevent uplift

Distribution Planning—IV

Fixing Regulator Settings

For satisfactory performance, operation of regulators on distribution circuits must be co-ordinated with system design and then the regulator settings may be determined to give best results

C. E. ARVIDSON, *Commonwealth & Southern Corporation, Jackson, Mich.*

AN ECONOMIC and adequate distribution system depends upon many factors, including the proper use of voltage regulators. Voltage regulator settings must be co-ordinated with the design of distribution systems to provide adequate service voltages. This requires an understanding of the voltage conditions to be satisfied and the various factors affecting these voltages. Improper regulator settings will result in unsatisfactory voltage conditions and may nullify the economies of well-designed circuits. Furthermore, circuit regulators should not be expected to compensate for an inadequate design.

Customer Requirements Govern

The purpose of this article is to discuss the voltage conditions which should be satisfied for urban overhead distribution circuits and to describe a method of determining regulator settings.

The purpose of a distribution circuit is to supply service to the customers at voltages which will provide satisfactory operation of utilization equipment. All distribution voltage conditions should therefore be governed by the voltage requirements at the customers' service entrance. Before the service voltage spread is determined it is necessary to know the voltage limits for which the customers' equipment is designed; *i.e.*, the approximate upper and lower limits of satisfactory operation. While these values may be rather approximate in some cases, the limits later shown apply to the more common utilization equipment.

Utilization voltages above or below these voltages will contribute to the unsatisfactory performance and decreased efficiency of life of the equipment. The design limits for most ranges, water heaters, radios and motors are the same whether this equipment is to be operated on systems using 115-volt lamps or on systems using 120-volt lamps. A compromise is therefore necessary in order to determine a reasonable and practical service voltage spread which can be used as a basis for distribution design and for determining regulator settings, as appears in the following:

Equipment	Design Utilization Voltage Limits Minimum	Design	Maximum
Ranges and water heaters	112	118	124
Radios	105	119	125
Motors	99	110	121
Lamps	...	115	...
Lamps	...	120	...

A study of the effects of high and low voltages on the various types of equipment indicates that the following service voltage spread should be reasonable, practical and satisfactory:

Lamp Voltage	Service Voltage Spread Maximum	Minimum
115 V	121 V (105%)	112 V (97%)
120 V	124 V (103%)	114 V (95%)

These voltage limits provide as broad a service voltage spread as possible without excessively penalizing the performance of any type of equipment. The extreme limits are slightly higher and/or lower than desired for certain types of equipment, but this will not be serious if the extreme voltage conditions are of short duration and affect only a comparatively few customers, which is usually the case.

The circuit voltage conditions which should provide adequate service voltages for residential customers are, for all practical purposes, as follows:

Lamp Voltage	Max. Equivalent Primary Voltage at 1st Transf.	Min. Voltage at End of Last Secondary	Design Voltage Drop
115	122 V (106%)	113 V (98%)	8%
120	125 V (104%)	115 V (96%)	8%

These design and operating voltage conditions should also provide satisfactory voltages for industrial and commercial customers provided their transformer-secondary and service combinations are properly designed for the conditions under which they must operate.

Voltage Conditions

The voltage profile shown in the illustration was prepared to show the probable full load voltage conditions on a properly designed and regulated residential distribution circuit. The voltage conditions shown in this profile were determined from studies of diversified residential demands for *maximum circuit load conditions*, which indicated that:

1. The probable usual maximum voltage drop in a customer's service would be in the order of 0.7 per cent (1 per cent for all practical purposes).

2. The probable light load on the first transformer (at the time of maximum circuit load) would cause a minimum voltage drop in the first transformer in the order of 1.2 per cent (1 per cent for practical purposes).

3. Transformer and secondary loads are changing continually, even while the circuit is carrying maximum load, with resulting transformer voltage drops which may vary from about 1 per cent to 4 per cent.

A study of this voltage profile will show that satisfactory service voltages should result if:

(a) The circuit is designed for an 8 per cent voltage drop between the primary of the first transformer and the end of the last secondary with maximum load on the circuit and

maximum load on the last transformer and secondary.

(b) The regulators are set to provide a voltage at the primary of the first transformer of about, but not to exceed, 125 volts (104 per cent) for 120-volt systems and 122 volts (106 per cent) for 115-volt systems, and

(c) The contact-making voltmeters are set at 120 volts for 120-volt systems and 117 volts for 115-volt systems.

Settings for Contact-Making Voltmeter

The contact-making voltmeter setting determines the probable mode voltage over a 24-hour period and therefore usually has a greater effect upon the life of utilization equipment than the maximum voltages at times of peak load.

Circuit or group regulators whose contact-making voltmeters and line-drop compensators have been adjusted to provide a voltage at the primary of the first transformer, which does not exceed the maximum desired voltage at maximum load conditions, should provide adequate utilization voltages throughout the circuit if the circuit is properly designed.

The contact-making voltmeter is essentially an a.c. voltage relay, so arranged that a movable beam is held in a balanced position between two stationary contacts. The voltage at which the movable beam is balanced is adjustable. The stationary contacts are also adjustable and the distance between the contacts determines the limits of operation or the sensitivity of the relay. Two small compounding coils are provided on induction type regulators, one on either side of the beam vertically, to provide positive action of the contacts. When a moving contact touches a stationary contact, the compounding coil will hold this contact closed until the voltage on the contact-making voltmeter has changed a definite amount. These coils are usually adjusted in the factory for 0.5 volts, but may be readjusted in the field. Improper adjustment of the stationary contacts or the holding coils may cause the regulator to "hunt."

The stationary contacts on a contact-making voltmeter should be set *as close as possible* without causing hunting or excessive operation. In general, these contacts should be set *not closer* than plus or minus 0.75 volts for induction type regulators, and for step type regulators the band width should be approximately as follows:

Size of steps.....	⅝%	1¼%	2½%	5%
Minimum band width.. (plus or minus)	1.0 V	1.25 V	2.5 V	5.0 V

The movable beam of a contact-making voltmeter should be adjusted so as to balance at 120 volts for 120-volt systems and 117 volts for 115-volt systems.

Line Drop Compensator Settings

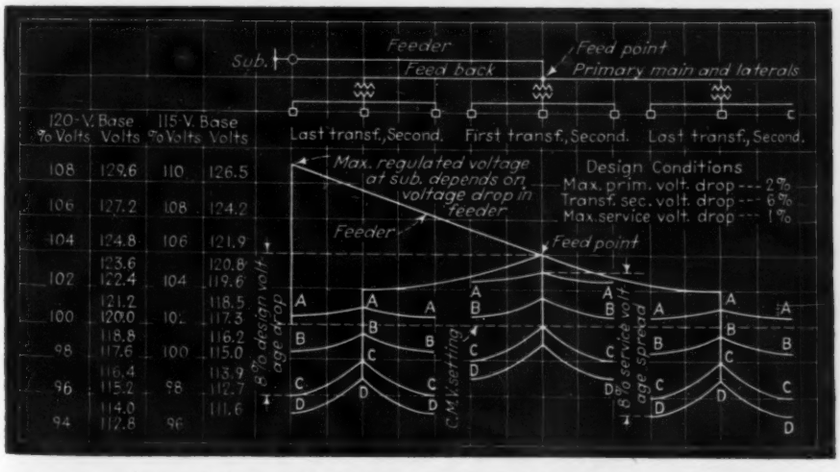
A line drop compensator consists of an independently variable resistance and reactance designed to give one volt drop per step or point when rated current is flowing through it. The compensator can be set to represent certain circuit characteristics and since the current flowing through this compensator is proportional to the load current in the line, a potential drop will be produced in the secondary circuit of the potential transformer and contact-making voltmeter which is equivalent to the voltage drop in the line.

Load Center Method

Compensator settings can be adjusted to hold a constant voltage, equal to the contact-making voltmeter setting, at some definite point called the load center. Calculations for such settings require the determination of a load center and the equivalent resistance and reactance of the circuit to this load center. The load center method of determining line drop compensator settings should be used only on circuits serving concentrated loads. Most distribution circuits serve several types of loads, generally classified as residential, commercial and industrial. In such cases, and on circuits serving residential loads only, the load center is changing continually, and for this reason the load center method of setting regulators is not recommended.

Circuit or group regulators whose line drop compensators are set to provide a full load primary voltage at the first transformer of not to exceed 106 per cent (112 V) of the nominal voltage for 115-volt systems and not to exceed 104 per cent (125 V) of the nominal voltage for 120-volt systems should provide adequate utilization voltages, if the circuit is properly designed. If the circuit is not properly designed and has excessive voltage drops, the compensator settings should still be determined by this maximum permissible voltage at the first transformer, and steps should be taken to correct the circuit design. The line drop compensators should, therefore, be set to compensate for the maximum feeder voltage drop between the substation and first transformer (or feed point) plus 4 per cent of the nominal voltage. The ratio of reactance to resistance in the compensator should be equal to the ratio of reactance to resistance in the feeder.

Frequent resetting of regulators can be avoided by calculating the line drop compensator settings for some



Probable voltage variation on distrbution circuit designed for 8 per cent drop. All conditions are for maximum load and 8 per cent drop

Curves A-A—Probable maximum service voltages—negligible drop in service.

Curves B-B—Probable average service voltages.

Curves C-C—Probable minimum voltage in secondaries.

Curves D-D—Probable minimum service voltages with probable maximum voltage drop in services.

REGULATOR SETTING DATA SHEET

Company

Sheet_____
Date_____
Made By_____

Division_____ Circuit_____

Place_____ Substation_____

Nominal Circuit Rating:-_____Volts,_____Phase, Lamp Voltage_____Volts.

SUBSTATION DATA

1. Unregulated bus voltage: - Maximum_____Volts, Minimum_____Volts.
   (For normal maximum and minimum loads - Not emergency conditions)
2. Transformer taps available: - H.V._____L.V._____
3. Present tap settings: - H.V._____L.V._____

CIRCUIT DATA

4. Turn ratio of distribution transformers_____
5. Attach a one-line diagram of feeder showing size, spacing, and length of conductors from substation to first transformer (or load center) and the ratings and tap settings of insulating, step-up, or step-down transformers which are between substation and first transformer (or load center).
6. *Maximum circuit load_____Amps. per phase at_____% P.F.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
19__												
19__												

*Note: - For group regulated circuits, give load data for each circuit as well as for maximum load on group regulator.

**REGULATOR DATA

7. Rating:-_____Amps____Phase, Induction Step Type,____% Boost_____% Buck____% Steps.
8. P. T. Ratio_____C. T. Ratio_____No. of C.T.'s_____
9. Rating of L.D.C._____Amp, L.D.C. tap setting_____Amps
   (Some load drop compensators rated 8.66 amps have 5 amp tap)

**Note: If regulators have self contained C.T.'s give complete name plate data.

PRESENT REGULATOR SETTING

10. R-Points_____X-Points_____C.M.V. Volts_____
11. C.M.V. - P.T. ratio_____L.D.C. - C.T. ratio_____L.D.C. tap setting_____
12. Pri. no load volts_____Max. regulated volts at sub._____
13. Substation transformer tap setting, H.V._____L.V._____

REGULATOR SETTING CALCULATION SHEET

Company

Sheet_____
Date_____
Made By_____
Checked_____

Division_____ Circuit_____

Place_____ Substation_____
(For data see Regulator Setting Data Sheet)

Note: If regulators have self-contained C.T.s consult Mfr's. instructions.

CALCULATIONS

A. I = Present maximum amps per phase + ____% = I = ____

B. Calculate the equivalent line to neutral resistance and reactance between substation and first transformer (or load center*)
   R = ohms. X = ohms. X/R = ____

C. Pri. N.L. volts = C.M.V. volts x P.T. ratio = = ____

D. I (R cos. θ + sine θ) =
   (x 1.73 for delta or x 2 for single phase circuits) = ____

E. Pri. voltage at 1st Customer = 1.04C = ____

*F. Max. regulated volts at Sub = D + E = ____
   *(F = D + C for load center method)

$Vc = \frac{F-C}{\text{P.T. ratio}}$ = ____

$Vr = \frac{Vc}{(\cos.\ \theta + X/R \text{ sine } \theta)}$ = ____

Vx = (X/R) Vr = ____

G. For all circuits using either 3 phase or single phase regulators

$K = \frac{\text{L.D.C. amp ratings x C.T. ratio}}{\text{I (1.73 for delta circuits)}}$ = ____

H. R-Points = K x Vr = ____

J. X-Points = K x Vx = ____

L. Using Vc for the circuit having the greatest feeder voltage drop, set substation transformer taps so that the light load unregulated bus voltage approx. =

$\frac{\text{Max. unreg. volts - min. unreg. volts}}{2} + \frac{\text{Vc x P.T. ratio}}{2} + C$ = ____

PROPOSED REGULATOR SETTING

R-Points_____ X-Points_____ C.M.V. volts_____
C.M.V. - P.T. ratio _____ L.D.C.-C.T. ratio_____ L.D.C. Tap setting_____
Pri. no-load volts_____ Max. regulated volts at sub. _____ at _____amps
Substation transformer tap setting, H.V._____ L.V._____

Regulator Setting Data and Calculation Sheets are work and record sheets combined

future load rather than present maximum loads. In general, these compensator settings should be based on a load equal to about 125 per cent of the present maximum load and thus be satisfactory for a 25 per cent load growth.

Transformer Tap Settings

Substation transformer tap settings are important in providing adequate voltage conditions. The full range of a circuit or group regulator cannot always be used unless the substation transformers are set on the proper taps. In general, the substation transformer taps should be set so that:

(a) The normal maximum unregulated bus voltage will not be too high for the regulators to buck down to the desired light load regulated voltage for the circuit having the smallest feeder voltage drop.

(b) The normal minimum unregulated bus voltage will not be too low for the regulators to boost up to the desired full load regulated voltage for the circuit having the largest feeder voltage drop.

(c) The margin of voltage regulator range beyond these two extremes will be about equal.

The accompanying regulator setting data and calculation sheets have been prepared for recording the data necessary for determining regulator settings and making calculations for regulator settings. These forms should be satisfactory for most circuits and are so arranged that the "Load Center" method or the "First Transformer" method may be used.

The "Regulator Setting Data Sheet" provides space for recording all of the information usually necessary for determining regulator settings and should be filled out or checked before any new settings are made. A one-line sketch should be attached to this sheet to show the complete circuit information when the load center method is to be used; *i.e.*, for circuits serving concentrated loads. For most distribution circuits, this one-line sketch need not show any information beyond the first transformer. Where two or more circuits are regulated by a group regulator, the maximum loads should be indicated for each circuit, together with the maximum load on the group regulator.

Space is also provided for showing present regulator settings, although this information is not always necessary.

The "Regulator Setting Calculation Sheet" provides a comparatively simple method of making calculations for regulator settings. Some of the items are explained below, but most of the steps need no further explanation.

A. The load on which regulator settings are to be based should be the present maximum circuit (or group regulator) load increased by 10 per cent to 25 per cent to provide for future load growth, thus eliminating the necessity of frequently resetting the regulators. Where two or more circuits are regulated by a group regulator, the current *I* used in step D should be the current in the circuit having the smallest voltage drop from the regulator to the first transformer and the current *I* used in all other calculating steps should be the total maximum current through the group regulator.

B. The equivalent line-to-neutral primary resistance and reactance should be determined on the basis of the nominal primary voltage. For most circuits, these values will be the resistance and reactance of one primary conductor between the regulator and the first transformer serving customers. In some special cases this equivalent resistance and reactance will include step-up, step-down or insulating transformers which may be connected in the circuit between the regulator and the first transformer or load center.

C. Where more than one circuit is regu-

[*Continued on page 106*]

Suggests Automatic Rate Adjustments

Anticipate price rises by previous agreements with state commissions — Apply per cent changes to fuel, labor or taxes without disturbing normal rate structures — Prosperous utilities are essential to welfare

C. W. KELLOGG, *President Edison Electric Institute* *

Inadequacy of revenue in the face of rapidly rising costs was a serious problem, sometimes dangerously so, for many electric utilities in the period during and following the last war. Fuel and labor costs were multiplied—coal up from $3.31 to $8.99 per ton at New England seaboard, wages of labor more than doubled—and the rises in others were small only in comparison with these. Caught in the vise of rising costs and fixed rates, the utilities made frantic efforts to secure permission from regulatory commissions to increase charges for service sufficiently for safety. In general they were accorded a measure of relief.

***Speaking before the Wisconsin Utilities Association, November 7, last, Mr. Kellogg suggested that power companies, in anticipation of national emergency and to avoid the confusion in which they struggled from 1914 to 1921, try to arrange with the government agencies having rate jurisdiction over them for a method of automatic rate adjustment to take cognizance of rapidly rising costs. The method suggested by Mr. Kellogg—as applied to a typical fuel power electricity supply system, recognizing that the factors will be different for a hydro system —is explained in his words in the following text.*—EDITOR'S NOTE.**

AS OF 1937, which I have taken on account of its being the latest year for which full comparative data are available, we find for the typical steam-generating group that of each dollar of gross operating earnings

10% represents fuel,

33½% represents payroll or other items likely to vary with payroll,

14.3% represents taxes, and

11.6% represents retirement appropriations.

The last two items are in themselves benchmarks from which future variations can be accurately measured. For the first two there may be room for discussion. For fuel we could take as a base either the actual cost of fuel per kilowatt-hour manufactured for 1937 or some recognized published index figure on the kind of fuel used. I am inclined to prefer the former, since it gives the public the benefit of any improvement in economy the company might make after 1937.

For payroll and other related items we could similarly take as a base either the cost of these items per kilowatt-hour manufactured for 1937 or the U. S. Department of Labor index for hourly wages of employees of electricity and manufactured gas companies. Again I am inclined to favor the former, not only because it gives the public the benefit of any more effective use of payroll the company might make in future, but also because it avoids the error that might arise if the conditions with a specific company did not show the same variation as the national average, which alone, naturally, the Department of Labor index shows.

With these four benchmarks in unit cost in 1937 thus established and the per cent of the gross earnings represented by each similarly agreed upon, it should be possible to agree beforehand between commissions and utilities on the extent to which rates should be raised or lowered to correspond with variations up or down from the four benchmark levels.

In making such an arrangement the utilities should in fairness be expected to be able to stand some degree of variations without rate adjustment. For this purpose I suggest that rate adjustments should start only at a point 10 per cent above or 10 per cent below the benchmark figures agreed upon. Another question will be as to the frequency with which such rate adjustments should be determined. Based on the record of the past, I suggest that such determinations be allowed not more frequently than once in six months.

For the purpose of data on which to base a proposed formula, let us assume, since it is simply a typical company we are considering, that the four benchmarks are as follows for 1937:

1. Cost of fuel per kilowatt-hour manufactured, mills, 3.

2. Payroll and other operation per kilowatt-hour, mills, 6.5.

3. Taxes (per cent of gross), per cent, 14.3.

4. Retirement appropriations (per cent of gross), per cent, 11.6.

Use of Formula for Adjustments

The rate adjustment formula would then be somewhat as follows:

For each per cent by which the cost of fuel for any consecutive twelve-month period may exceed 3.3 mills per kilowatt-hour manufactured or be less than 2.7 mills per kilowatt-hour, rates shall be increased or decreased respectively 0.1 per cent.

For each per cent by which the cost

of payroll and other operating expenses (except fuel) in any such twelve-month period shall exceed 7.15 mills per kilowatt-hour manufactured or shall be less than 5.85 mills per kilowatt-hour, rates shall be inincreased or decreased respectively ⅓ per cent.

For each per cent by which the cost of taxes in per cent of operating gross earnings in any such twelve-month period shall exceed 15.73 per cent of gross earnings or shall be less than 12.87 per cent thereof, rates shall be increased or decreased respectively 0.14 per cent.

For each per cent by which the appropriation for retirement reserve in any such twelve-month period shall exceed 12.76 per cent of operating gross earnings or shall be less than 9.44 per cent thereof, rates shall be decreased or increased respectively 0.12 per cent.

Surcharge or Discount

Such increases or decreases in rate, applied on a percentage basis to each bill for service of all classes, shall be in the form of a surcharge or discount respectively. Requests for any rate adjustments under the plan shall be based upon a determination of actual costs certified by an independent public accountant approved by the commission. The benchmark figures for 1937 shall be based on costs similarly certified.

The reason for suggesting the application of the surcharge or discount on a percentage basis is to avoid disturbing the rate structure with its recognition of differences in size, load factor, time, diversity, service conditions, etc., that cause variations in kilowatt-hour rates. In general, the flexible provisions proposed are not intended to supersede such rate adjustments as changes in service conditions may from time to time make desirable, but are intended only to correct for the radical changes in basic costs that have been referred to.

The percentages I have used in my suggested formula have been carried out to two decimal places simply to make clear how they were arrived at. In practice it would be expected that they would be rounded out to much simpler quantities.

A precedent for the plan proposed exists in the so-called "Bordeaux Order," adopted by the Council of State of France in March, 1916. This provided for increases in electric rates to reimburse for all new taxes affecting the utilities and to correct for increases in wage rates and for increased cost of coal per ton. In this order the price variations were to be based on index prices for labor and coal published respectively by the Prefect of the Seine and the Minister of Public Works. This arrangement has the obvious advantage of being based on impersonal official figures. My reason for suggesting variations in the unit costs of individual companies in our country was the feeling that there were much greater differences in conditions with us than exist in France.

The question will naturally arise as to why state commissions should consent to the flexible rate plan proposed or to such other plan as would fairly reflect the basic conditions affecting any given utility company.

In general, it is in the public interest that the utilities be kept strong financially. The Hon. Harold L. Ickes, chairman of the National Power Policy Committee, speaking in New York less than two weeks ago to the Coal Association, put the matter so clearly that I quote his words:

> *Whether we like to admit it or not, we—the nation as a whole—cannot afford to let any major industry, no matter how much it wants to do so, bankrupt itself. Every business and industry is an integral part of a whole, like strands in a tapestry. You cannot tear one without damaging the whole fabric.*

The electric utility industry does not want to bankrupt itself. On the contrary, with its constant need for $6 of new capital for each $1 of new gross revenue, no industry, for the public good, needs more desperately to keep itself financially solvent.

Furthermore, the state commissions, in making such flexible rate arrangements as I have suggested, need not feel that they are helping to promote or to perpetuate any excessive return on investment by the utilities, for the exact reverse is the case. As I pointed out in a recent paper, the latest U. S. Census Report (for 1937) shows that the four billion dollars the utilities have raised nd spent on extensions to their properties in the last decade have been ccomplished with an increase in net earnings which amounts to only 2.3 per cent per annum on that huge total. With this relatively discouraging showing for the past decade, any further diminution of net would be a cause for public apprehension, so that the mere holding of the present status could not therefore be fairly held up against any commission as being an improper concession to the utility company.

On the contrary, with the effect of the last war on costs so clearly spread out on the record, and the knowledge of how seriously these changes affected the utilities before relief could be obtained, it would seem but the wisdom of intelligent men, both commissioners and utility officials, to work out now some relatively automatic method of meeting similar developments if they should occur in future.

Value of Flexible Rates

I omitted from my formula allowance for increases or decreases in the cost of money, because of the relative uncertainty as to how such variations would affect an individual company. I might add that I can think of nothing that would help more to mitigate this difficulty than a general provision by commissions country-wide for flexible rate clauses to care for major cost variations. The investor confidence which such a move by commissions would generate would go a long way to offset the effects of such a higher cost of raising new capital as appeared during the last World War.

Another consideration that should make some flexible rate formula logical at the present time, where perhaps it may not have seemed so in the past, is the greater maturity of the electric utility business at the present time. The investment in the electric utilities is today nearly five times what it was in 1914. The knowledge and understanding of the business by utility commissions has similarly increased. Rates are lower; rates of return are lower. Twenty-five years of commission regulation have produced conditions of stability which in the public interest can wisely be preserved by flexible rates.

Since the World War the progress of rates has been a one-way street—always down, never up. This process has been made possible by the improvements in efficiency and econ-

[*Continued on page 107*]

Boost Plant Capacity at Cost of $5 per Kw.

Larger diameter impellers add 6,000 kw. to hydro plant for brief peaks — Cooling coils protect the generator during enlarged load periods — Turbine efficiencies enhanced

E. W. BROWN, *Vice-President Kentucky Utilities Company, Lexington, Ky.*

SYSTEM peak loads of the central system of the Kentucky Utilities Company, associated and subsidiary companies for less than 100 hours each year are customarily up to 10 per cent higher than during the remaining hours of the year. As the existing facilities became loaded it was evident that a generating source having a low investment cost was needed to handle this portion of the load. Since the total kilowatt-hours involved was relatively small and represented no substantial withdrawal from the 25,000,000 kw.-hr. water storage capacity of this peak-load station, it was decided to attempt an increase in capacity of the Dix Dam hydro plant of the Kentucky Utilities Company.

Study disclosed that the maximum generating capacity of this plant could be increased from 22,500 kw. to 28,500 kw. at a cost of $30,000, or $5 per kilowatt, by the comparatively simple expedient of installing larger, improved impellers in the three hydro turbines and providing air-cooling equipment for the generators.

The original installation at Dix Dam consisted of three units having a rating of 7,500 kw. each at an operating head of 235 ft. During a normal year head ranges between 235 and 180 ft.

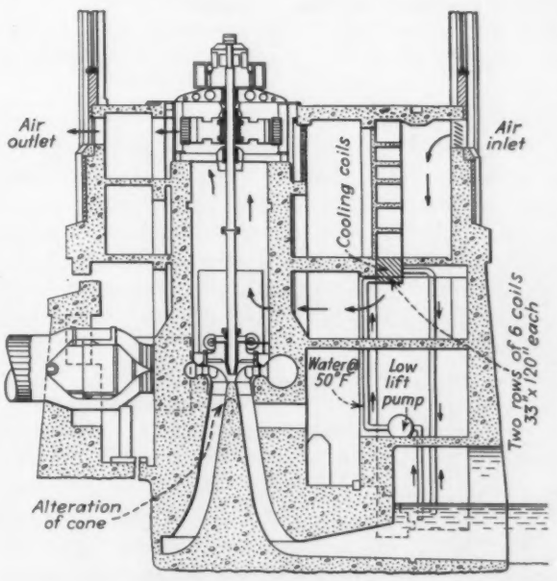
During the rainy season the Dix Dam station carries a base load and the balance of the load is carried by steam sources. Throughout the balance of the year the Pineville steam generating station of the Kentucky Utilities Company operates as a base-load plant and Dix Dam operates on the upper portion of the load curve, with steam sources of higher cost carrying the remaining load. The upper portion assigned to Dix Dam varies with rainfall and the amount of available storage.

When the matter of building additional horsepower into the turbines at Dix Dam was placed before the manufacturers they proposed to furnish new impellers of an improved design having a 5.45 per cent greater diameter, together with a new seal ring and inner draft tube liner, without alterations to the casing. In addition, some field alteration of the pistons was necessary to provide a wider gate opening. The entire change contemplated an increase in power ranging from 25 to 28.5 per cent at the different operating heads.

To handle the increased loads on the generators safely, cooling coils were inserted in available floor openings which originally provided the path for air circulation to the generators. The cooling coils are supplied with water at 50 deg. F., circulated from the tailrace by a small, low-head pump. No additional equipment was necessary, nor were other changes necessary in the generator air circulating system.

Work was completed in January, 1939, and the results have proved somewhat better than anticipated. For 720 consecutive hours the average hourly output was 31,200 kw., with the elevation in the lake ranging within 4 ft. of the top and the generators operating within safe temperature limits. At the present time elevation of the lake is 20 ft. from the top and capacity of the plant is 27,500 kw., or 31 per cent greater than the original capacity at this elevation. At the time of completion of the second unit the lake elevation was 42 ft. from the top and tests on the two units indicated a plant capacity of 24,200 kw., which is 33 per cent in excess of the original capacity under similar conditions.

Turbine efficiencies at normal operating capacities are slightly increased. Salvage of water previously lost in spillway flow, improved control over lake level during the rainy season and an appreciable amount of capacity reserve available for system contingencies are also obtained by this simple expedient.

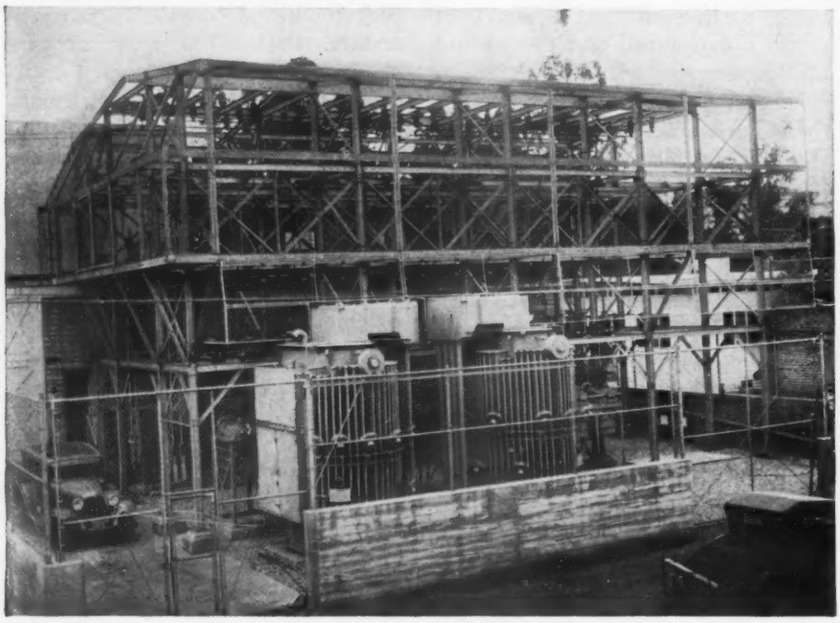


Air cooling for generators and impeller sealing and piston alterations boost hydro plant capacity 6,000 kw. at cost of $30,000

New Substation Serves Underground "Bus"

Transfer bus extended with cable for reliability — Reactors used to balance circuits for bus regulation — Primary side of substation of outdoor design

K. R. BIRGE, *Electrical Engineer, Pasadena Municipal Light & Power Department*



The 17-kv. side of Pasadena's new Maryland substation is outdoor
Two 6,000-8,000-kva. transformers are installed and a third is provided for. They are equipped with automatic tap changing under load. The entire structure is inclosed in wire-mesh screen

MARYLAND substation now supplies power to the main business and commercial district of Pasadena. This area is an unusually long, narrow rectangle measuring about 3 x ½ miles. Almost all of it is served underground. Prior to completion of Maryland, the section was supplied from a 2,400-volt delta radial substation adjacent to the main generating station.

The new station necessitated little change in the distribution system itself, except for replacing switches with a new type of oil cutout and installing the necessary feeder mains between the new station and circuit centers.

Maryland is in general a conventional radial-type, 2,400-volt, automatic substation receiving power through transformers supplied from a 17-kv. loop, the power source being 2 miles away. Normally the station is operated under complete supervisory control from the power house. This includes operation of all circuit breakers and indication of all voltage, current and power meter readings and indication and control of main-transformer tap changers. An alarm signal gives warning of abnormal operation or low voltage. Hence the operating condition of any circuit on either the 17-kv. station or the 2,400-volt station may be checked at any time.

Two significant features which differ from the average run of stations of this type are:

1. Automatic bus-voltage control is the only regulation provided. Impedances of the various circuits are equalized with reactors.

2. Extension of transformer bus with cable to parallel all main circuits for emergency service.

Automatic Bus Regulation

In any substation of this type it is important to provide means of maintaining proper voltage with minimum regulation at each circuit center. Ordinarily, the combined variations in feeder lengths and load characteristics make it necessary to regulate each circuit separately, and line-voltage regulators are used for this purpose. However, this station was to serve only the commercial district, in which practically all circuits would have similar load characteristics and where load changes would occur at the same time and in approximately the same proportion.

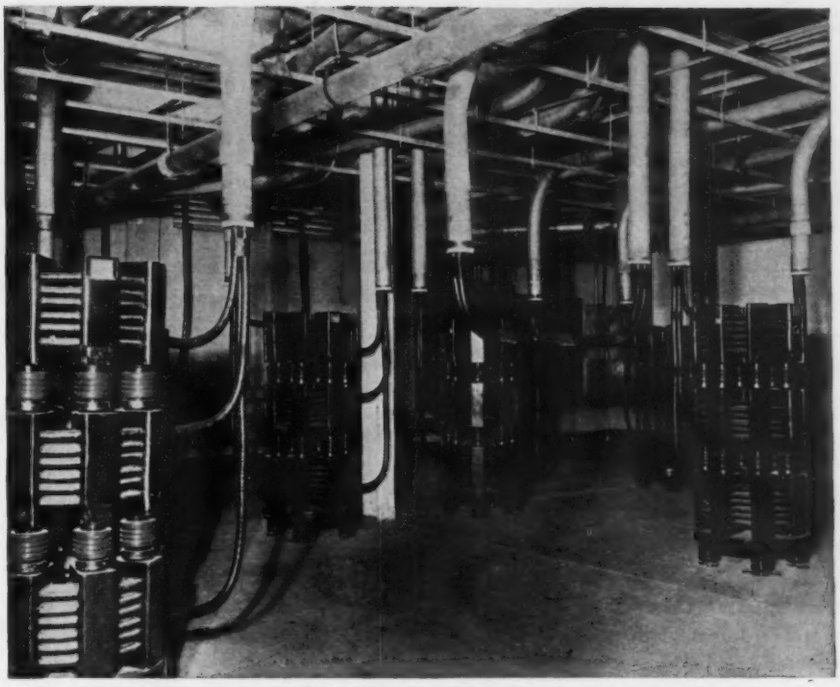
In connection with this problem, it was necessary to consider the magnitude of short-circuit current values. The impedance of the average main feeder had been reduced materially through reduction in its length, increase in cross-section and, principally, through the fact that its entire length was to be underground cable from the new station, whereas it previously was partly overhead.

Another factor was that system generating capacity had been increased, and, further, a connection to another major power system was to be made (now actually completed), namely, Boulder power, through the 34-kv. distribution system of the Los Angeles Bureau of Power and Light. Calculations indicated that it would be advisable to install current-limiting reactors on at least the shorter feeder cables to protect transformer

fuses and 2,400-volt service switches against excessive short-circuit currents.

Further studies indicated that the impedances of the different circuits could be equalized by using reactors of different sizes and that such was both economic and feasible from a space standpoint. Considering estimated loads on the various circuits, calculations indicated that a 5 per cent reactor on the shortest cable, 3 per cent reactors on the intermediate lengths and none on the long cables, would give uniform voltages during peak loads. When the loads increase on the longer circuits it may be necessary to increase the reactance on the shorter circuits. It is a simple matter to change the reactors, or, if necessary, to install line regulators in extreme cases, as provision is made for making this connection also.

Should the regulation of any circuit be impaired as the result of a low power factor load, this could be corrected by installing capacitors near the offending load. This scheme would be very effective on those circuits having reactors. The power factor of the average circuit during peak hours approaches 90 per cent at this station because most of the present load is lighting. Furthermore, the capacitance of the three-phase cable in the entire section has no small effect on the over-all power factor of the system.



Reactors, located in substation basement, are used to balance the impedances of distribution circuits, permitting bus regulation. Both main and control conduits are suspended from the ceiling

Transfer Bus Extension

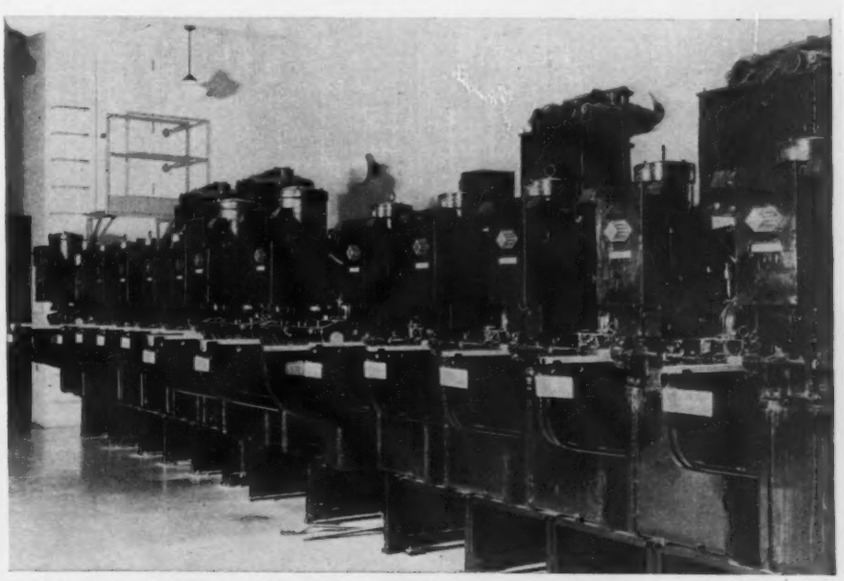
Operations have proved the voltage regulation to be entirely satisfactory. Recording charts taken at various points indicate good voltage.

Bus voltage is regulated by automatic, tap-changing-under-load transformers and controlled by a regular contact-making voltmeter and compensator. The regulators may control the transformers either separately or together. The resultant regulation is like that of one extremely large circuit, effect of load variation is small because any nominal load change is a small percentage at any one instant. Taps on the transformers are spaced at 1½ per cent.

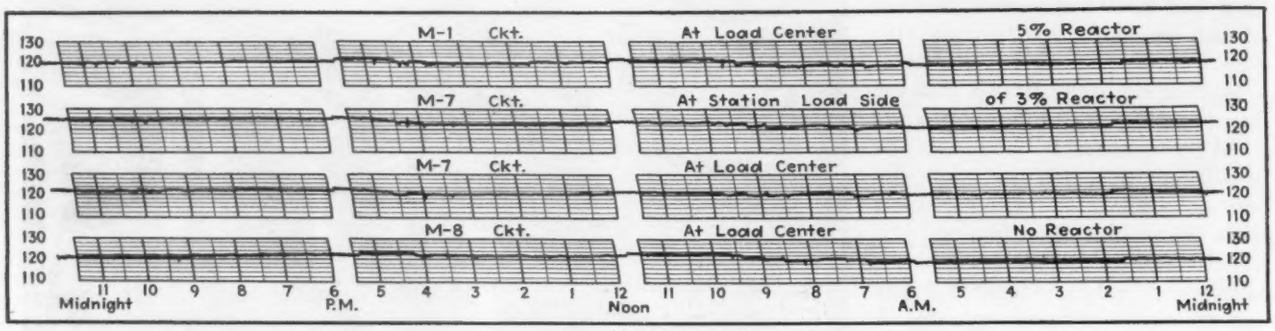
Underground distribution systems in general require duplicate feeder systems to provide continuous service while a section is cut out for repair. It has been common to overlap the extremities of adjacent circuits, the emergency service being mutual. This system was satisfactory when only small sections were involved, but was cumbersome when large sections or entire circuits had to be transferred. Failure on a main feeder required a tremendous amount of switching to restore service. Sometimes consequent overloading of adjacent circuits required further switching for relief. The process of returning all operations to normal was likewise cumbersome.

The magnitude, or rather the concentration, of loads within the area served by this station made it feasible to install two separate cables, one on each of two parallel streets, through practically their entire lengths. This cable is to be used only for transfer or emergency service. It is three-conductor, 750,000-circ. mil, lead-covered.

Connection in the substation is through double-throw disconnects to either the transfer bus direct or to the oil circuit breaker feeding it. In each major vault provision is made for switching load to either the main or transfer cable. The same switches



The 2,400-volt side is indoor and employs metal-clad switchgear



Voltages taken on three typical distribution circuits at various points. Peak hours are from 3 to 7 p.m.

make it possible to sectionalize any main feeder and to connect either part, or all, of the circuit load to the transfer cable with usually not more than two (sometimes three) switching operations. Thus the duration of service outages will be cut to a minimum. Adjacent circuits will not be affected. The transfer cable has sufficient capacity to carry two whole circuit loads for a few hours.

The switch or oil cutout used in the vaults is a recent development and is a single-phase oil cutout with four cable-terminal connections and a disconnecting blade for each, and is rated 500 amp. at 5,000 volts. In general, it is connected in series on the main cable with one branch feeding the transformer bank. At sectionalizing points, a branch is connected to the transfer cable. As can be seen in an accompanying illustration, the series connection of cutouts enables a cable man to sectionalize any one portion of a circuit (without disrupting service at any place) by switching at usually two, but not more than three, points. In case of cable failure it will be possible to restore service by isolating the bad section with the same number of switching operations.

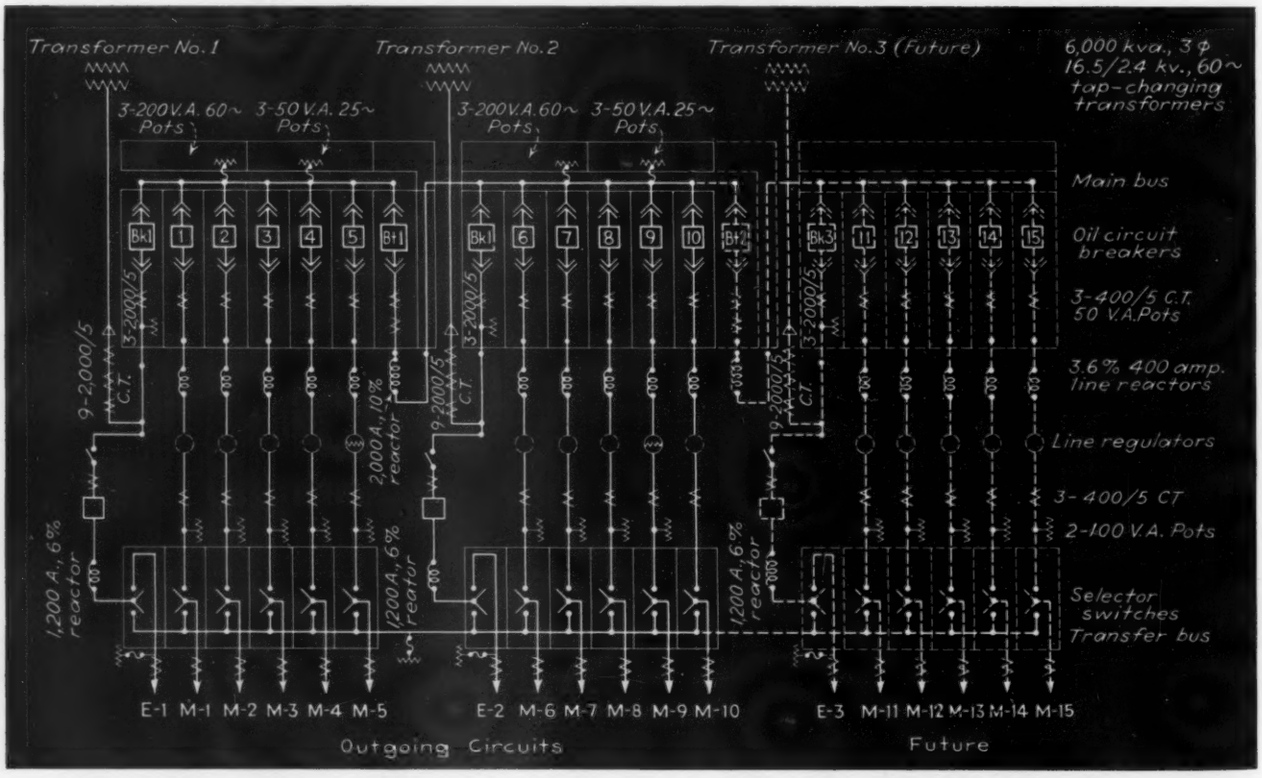
Under present plans the emergency cable is designed to supply only the area served by the Maryland substation. Operation indicates that it will be desirable to extend emergency service from this station to adjacent areas normally served from other stations. Connections between the present emergency cable and these other circuits can be made with a nominal investment.

A further thought on the plan suggests that it may be feasible to develop the same system at the other stations and still further to interconnect emergency circuits, thus reducing standby transformer capacity. Temporary use of the transfer cable for connecting from the old to the new station proved invaluable.

The transfer cable will be useful should it prove desirable to convert to a 4,000-volt-star system.

General Arrangement of Equipment

The 17-kv. switching structure, in addition to serving this station, serves for sectionalizing lines feeding two other distribution stations as well as several small substations sup-



Maryland substation, single-line diagram

plying power to water pumping plants.

The structure is an outdoor, open-steel frame with double deck and a main bus in each deck. One oil circuit breaker for each incoming or outgoing line and for each transformer and disconnects for each bus are provided. A bus tie and sectionalizing disconnects provide for operating the station separate from lines connecting to other substations if desired.

At present there are two of the three-phase, tap-changing transformers with a double rating of 6,000–8,000 kva., the higher value being obtained with forced-draft air-cooling equipment. Space is reserved for a third.

Routine Inspection General

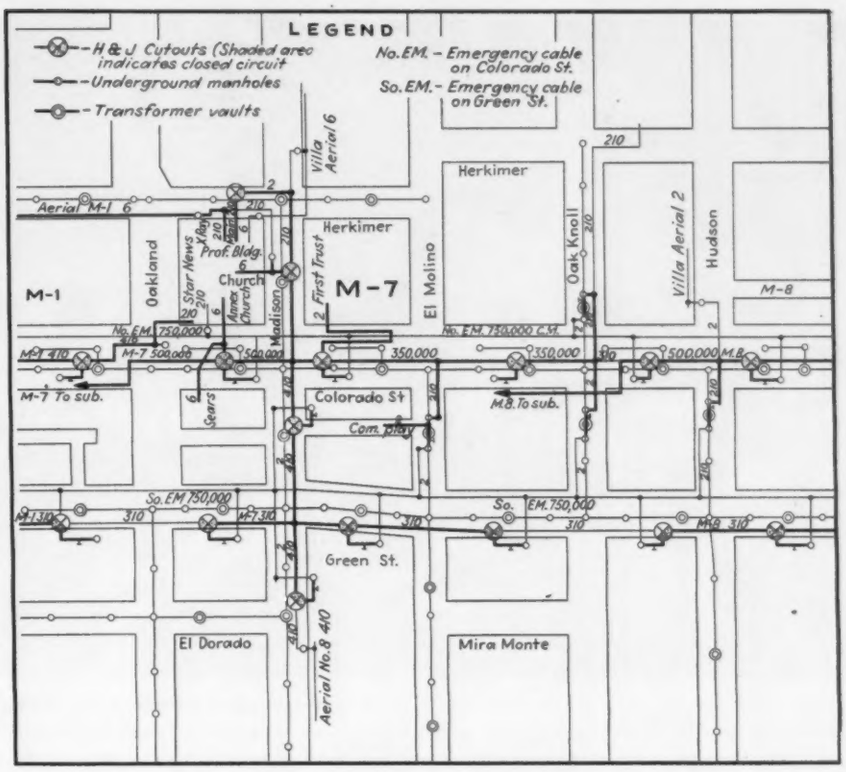
The 2,400-volt station is indoor type, housed in a reinforced-concrete building, single story with basement. Main floor dimensions are approximately 47 x 69 ft. Routine inspection several times daily of this station as well as of the two other stations is a matter of general policy.

The supervisory control has proved invaluable in restoring service immediately after abnormal operation. Thus far only two outages have occurred, one due to false operation of the relay, the other to a flashover in the 17-kv. bus, caused by a rat grounding out the bus. As will be noted in an accompanying illustration the voltage regulation maintained throughout the day is about as close to normal as can be obtained.

Each transformer feeds a section of metal-clad switchgear having one main breaker and five outgoing circuit breakers. The two sections are tied together with a bus-tie breaker. An open-type transfer bus is supplied directly from either transformer through oil circuit breakers and through double-throw, gang-operated disconnects, which also provide the connection for the transfer bus cable that parallels the main feeders.

The transfer bus rack supports the double-throw, gang-operated disconnects by which each main circuit may be connected to either its circuit breaker on the main bus or to the transfer bus.

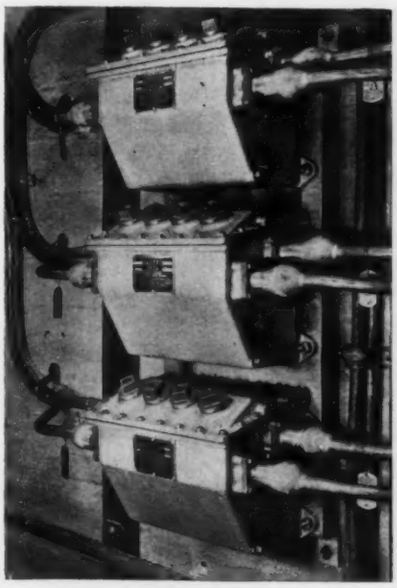
Three-conductor, 500,000-circ.mil, lead-covered cable is used for main feeders.



Disconnects are so arranged that circuits may be sectionalized or shifted to service through the transfer bus with only two or three field switching operations

Both indoor and outdoor breakers are remote controlled. Two all-steel panelboards, mounted back to back, but with working space between them, contain all control and protective equipment and all indicating, recording and integrating meters. The control switches and indicating instruments are on the front panel, and all operating and protective relays and recording instruments are conveniently grouped together on the rear panel.

Included in the board are two panels for supervisory control providing for complete operating supervision at the power plant, two panels for automatic operation of transformer taps for bus regulation and two panels for station auxiliary and d.c. power.



Howze-Judson disconnects are used in underground vaults

Major Equipment Used

High-Voltage Station—Steel frame structure, department design; fabrication by Pacific Iron & Steel. Insulators, Lapp station post type. Oil circuit breakers, Kelman Electric. Tap-changing transformers, General Electric.

Indoor Station—Building, Cyril Bennett, architect; Atlas Construction, W. C. Crowell, builder. Main switchgear, Allis-Chalmers. Transfer switchgear, department design. Disconnect switch, Bowie Switch Co. Oil circuit breakers, General Electric. Switchboard panel, department design; fabrication, Trumbull Electric Manufacturing Company. Control switches, General Electric. Instrument switches, General Electric. Indicating instruments, Weston. Relays, recording instrument, transformer control panels and equipment, supervisory control equipment, General Electric. Control battery, Willard Battery Co. D.c. motor-generator set, Electric Products Co. Instrument transformers, Allis-Chalmers.

Circuit and Cable Equipment—Cable, General Cable Corp. Shielded, lead-covered cable, Okonite Cable Co. Underground switches, Howze-Judson oil cutouts.

Intelligent selling keeps signs operating in Muskegon, restores revenue and load

Sign Survey Halts Load Mortality

Electric sign check-up in typical city discloses that only two-thirds are illuminated — Sales follow-up restores 69 per cent to full-time or part-time operation

L. L. BOOTH, ***Superintendent Power and Lighting Dept., Muskegon Division, Consumers Power Co.***

PROMOTION and sale of electric signs are a part of the work of every successful lighting salesman, and no report of a lighting sales department is complete without an item showing new sign load. But too often we neglect the *retaining* of this load and think only in terms of "new business." The load must be kept on the line to be profitable. How many signs are there in your town that are connected but not in use? It's ten to one that an actual survey will show you a percentage of signs not burning which will be several times larger than your first guess.

Complete Sign Survey

One night it was noticed that several neon signs near the Consumers Power Company office building in Muskegon, Mich., were only partially burning. This suggested the idea that if a few signs were only partially illuminated in only one block there must be plenty of others of all types throughout the city not being used due to need of repairs or for other reasons. This idea hatched the next day into a plan for a complete sign survey. During the day a list was made up of 223 signs on eight business streets in Muskegon and this was followed by a night survey. The survey was made between 9 and 10 o'clock in the evening and the operating condition of each sign was indicated on the list. The results were most surprising. Out of the total of 223 signs, 72 were not burning and five were only partially illuminated. Also, it was noted that twelve show windows located exceptionally well for night traffic were in darkness.

In following up the survey it was decided, first, to send a personal letter to each merchant whose sign was not burning. These letters were sent out at a rate of about twelve per week in order that they could be followed immediately with a call by the lighting engineer. The letter stated that the lighting engineer had observed the merchant's sign to be in darkness and asked him why he was allowing this investment to stand idle. It pointed out a number of benefits to be derived from luminous advertising, such as keeping the name and business constantly before the public, attracting new business, advertising the product at the point of sale and, finally, the low cost as compared to other means of advertising.

Within a few days after the letter

[*Continued on page 55*]

3,752 Customers Step Through Their Electric Bills

In campaign to get customers to read the company's advertising Alabama Power gets letters from 3½ per cent of its customers telling advantages of private company services

PUBLIC RELATIONS SERIES

THREE and a half per cent of the total domestic customers of the Alabama Power Company wrote letters in a contest that was not designed primarily as a contest. The real purpose was to get the customers to read the company's advertising and to consider their electric bill as something other than a piece of paper demanding the payment of money with monotonous regularity. The company wanted them to regard the bill as a charge not only for so much electricity, but for intangibles as well.

The prizes were very modest—100 prizes at $5 each. But everybody who wrote a letter got something. Those who didn't win a prize got a 100-watt bulb.

Through newspaper advertisements and bill stuffers customers were invited to write letters telling what they saw behind the electric bill. The information to help the customer write the letter was in the advertisements and more was contained in a booklet that could be had for the asking.

Three thousand, seven hundred and fifty-two letters were received, where only a thousand had been anticipated.

Whom did they come from? All classes—minimum-bill as well as full-use customers.

About half the replies came from towns where the company had offices, the remaining being about equally divided between customers in other towns and RFD customers.

YOUR TOWN, ALA.
THE ALABAMA POWER CO.
PAY TO THE ORDER OF
One Hundred Citizens of Ala.
DOLLARS
Reddy Kilowatt
FIVE DOLLARS
for telling
WHAT YOU SEE BEYOND YOUR ELECTRIC BILL
THERE ARE NO STRINGS TIED TO THIS OFFER
You Need Not Buy Anything To Participate
WRITE YOUR LETTER SOON
HERE ARE THE SIMPLE RULES TO GET ONE OF THE HUNDRED PRIZES
ENTRY COUPON
ALABAMA POWER COMPANY
A Private Agency for the Public Good
REMINDERS

Typical of contest advertising copy

	Customers In Towns Where We Have Offices Made More Than Casual Mention of	Customers Located Elsewhere
	Per Cent	Per Cent
Better lighting as an aid to better vision	34	32
Elec. iron as a labor saver	9	11
Elec. washing machine as a labor saver	7	14
Radio	20	20
Elec. refrigeration	19	16
Elec. cookery	19	10
Elec. water heating	4	1
Low cost	38	36
Comfort, time, labor saving health advantages	51	40
Rural electrification	14	23
Running water	3	7
Industrial development activities	6	4
Good service	6	5
Commendation of employees	4	2
School benefits from taxes paid	18	17
General benefits from taxes paid	27	18

What did the customers see back of their electric bill? They saw comfort, health and convenience first, then they saw low cost, better vision, and general and school benefits from taxes paid by the company. A complete breakdown is shown in the accompanying table. Note that the percentage of customers in these groups are of those who made *more than casual* mention of the subjects listed.

A paragraph or two from one letter—a man in Talladega—summarizes the spirit of most of them:

"The bill which I receive each month for electrical service," says Roy Evans, "has always represented to me an account which I owed one of my local friends for one of the necessities of comfortable living. I hear a lot of great corporations and affiliations with nation-wide holding companies, but when I know personally all of the local power company employees and count them as

friends, so far as I am concerned, they are my power company just as any other local merchant may be my grocery, clothing or coal merchant.

"However, the thought of stepping through my bill would naturally cause me to think of the company they work for. It takes no great knowledge of economics for me to realize the large part this company plays as a taxpayer, payroll maintainer and source of sound investment for those who are able to buy their stock. It takes no great knowledge of industry for me to realize the wonderfully efficient manner in which this business is operated in order that I may use electricity at the price I pay. Since I must judge this company solely by what I actually know about it, I must again return to my local power company and there find that to a man they are unsurpassed as local citizens. They are the product of the regulations of their company to a great extent, so I must assume that elsewhere, as here, the power company is a good citizen."

Industrial and Utility Systems Co-ordinated for Reliability

Engineers of industrial customer and of utility get together to design customer's distribution system and substation in conformance with utility practice in effort to assure maximum freedom from service interruptions

TONY F. OFFENBACKER, ***Meter and Relay Department, Indianapolis Power & Light Company***

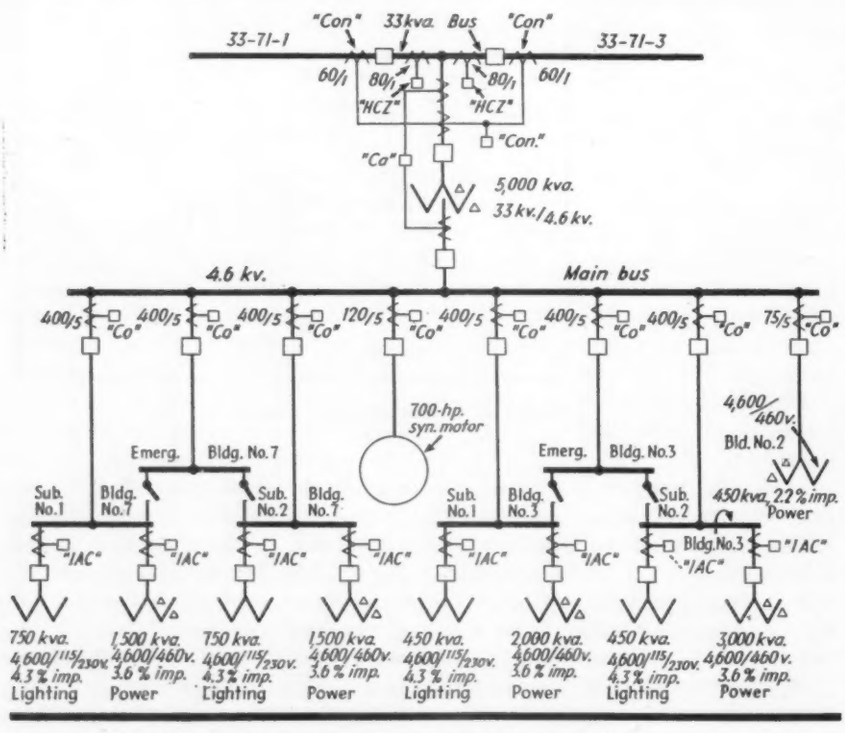
CO-ORDINATION of the electrical distribution system design for the International Harvester Company's new $4,500,000 plant at Indianapolis with the high-voltage supply system of the Indianapolis Power & Light Company has resulted in a unified supply arrangement for this plant that affords minimum opportunity for service interruption and maximum utilization efficiency.

High points of the design include: Two normally closed incoming 33-kv. supply lines with high-speed and distance relay protection, supervisory control of high-voltage breaker operation from the utility load dispatcher's office, modern centralized bus and metal-clad switchgear equipment, separate normal and 4.6-kv. emergency supply feeders to step down substations at plant load centers, and relay protection throughout co-ordinated with supply line protection.

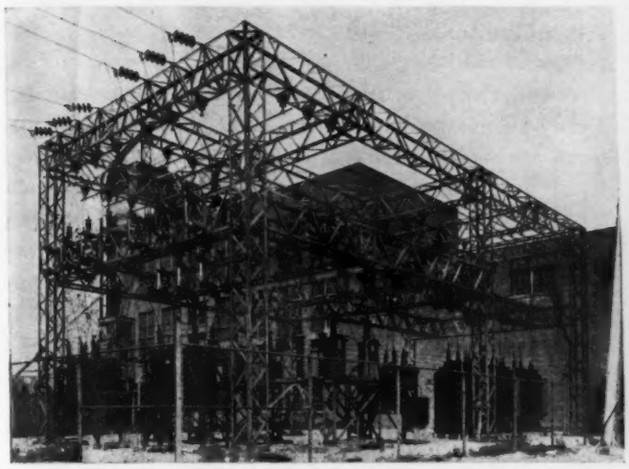
For immediate needs a main transformer bank of three 1,667-kva., 33/4.6-delta-connected units has been provided with provision for two similar banks to meet future needs. Main transformers are supplied from the two 33-kv. supply lines, which are brought in to a common 33-kv. bus.

Three Deïon grid oil circuit breakers are provided on the incoming lines and the power bank. Since this type of breaker is standard equipment on the utility system, the system design could be maintained constant. "HCZ" high-speed and distance relay protection has been provided on the incoming lines, while the 33-kv. bus has "COH" relays arranged for differential protection. "CA" type ratio differential protection is provided for the transformer bank.

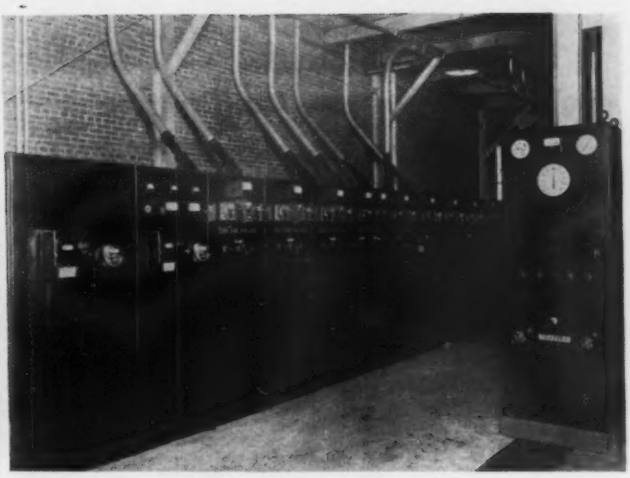
Since two of the utility company's 33-kv. lines feed the substation it was



Co-ordinated industrial system design has high reliability
One-line diagram of general electrical system, normal and emergency sources of power and lighting banks and relay protection at International Harvester Company.



Main substation and switchyard
Left—Two incoming 33-kv. oil circuit breakers on left, instrument and metering transformers left center, bank oil circuit breaker right center. The 5,000-kva. power transformer banks are on the right. Right—Cubicle on left contains 33-kv. line "HCZ" and ground



Main 4.6-kv. bus and feeder switchboard
relays, bus and bank differential relays and utility metering equipment. Second cubicle contains industrial plant metering equipment. At extreme right is 700-hp. air compressor synchronous motor control panel.

considered necessary that the International Harvester Company work directly with and under the orders of the utility load dispatcher when switching on the 33-kv. line is contemplated. The 33-kv. line o.c.b.'s are supervisory controlled from the load dispatcher's office. This arrangement was readily accepted by the Harvester company for the mutual protection of both companies.

Output of the main transformer bank is supplied to a 4.6-kv. main bus, from which feeders radiate to four distribution substations at the various plant load centers. As shown in the schematic diagram, each of these has both a normal and an emergency feeder, serving two substations. Each of the four substations consists of a lighting and a power bank supplied from a single bus to which the emergency feeder may be connected by a disconnect switch. All of the 4.6-kv. feeders have overload induction relays for protection.

All circuit constants and load demands for the system were submitted to the utility company with the request that a short-circuit study be made for the plant and that relays be set and calibrated. This work was done by the power company without cost. The close co-operation between the two companies during the periods of design and construction has not only made it possible to co-ordinate the two systems so that service interruptions will be the least possible but has also resulted in a substation and distribution system that operates to the advantage of both organizations.

Sign Survey Halts Load Mortality

[*Continued from page 52*]

had reached the customer the lighting engineer called to complete the "sale." He was armed with facts and figures on that particular customer's kilowatt-hour use and current cost so that he could say: "Mr. Blank, do you know that you can operate that sign four hours every night in the month for only $2.50 increase in your monthly electric bill?" It was found that most of the customers were very receptive and that they felt a sense of appreciation for this personal interest in the appearance of their store fronts.

Some of the reasons given for not having signs lighted were: Negligence, a feeling that no tangible results came from burning the sign while the place of business was not open, need of repairs to the sign, dissatisfaction with the appearance of the sign, and the belief that the operating cost was high. These only begin to indicate the interesting sales problems which the lighting salesman encountered.

The results obtained were exceedingly gratifying. When the second night survey was taken, a few months later, it was found that out of the 72 that were not being used previously, 29 are now operating full time each night, 21 are being used part of the time, fifteen are to be replaced with new signs in the immediate future and five are still out. These last five were in need of repairs and arrangements had been made to repair them. Two other signs belonged to merchants who were no longer in business. As for the twelve show windows, ten are now doing their part in night advertising and selling.

Fifteen customers had their signs repaired, one customer spending more than $100 to have a 3.5-kw. sign relamped and repainted. Five customers purchased new time clocks and one sign was completely remodeled, following our suggestions. A local clothier had three signs and the window connected to one time clock where previously he was using the clock only on the windows. Of the five signs that were partially burning, all have been repaired. The total load returned was 18.5 kw. for signs and 13.8 kw. for windows or 32.6 kw. in all, with revenue estimated at $1,400 a year.

It was evident from the second survey that a program such as this must be followed through several times a year as seven signs were off that had been in use at the time of the first survey only two months before. This type of load building is particularly good in depression times as it involves little or no investment by the customer. But the retaining of load once built up is always, in good times or bad, an important part of every lighting department's work.

Editorials

S. B. WILLIAMS, *Editor*

Voters Turn Down Municipal Ownership

NOVEMBER 7 was one of the quietest elections in recent years on municipal ownership. In only a handful of cities was the question on the ballot. With the exception of Provo, Utah, where three years ago bonds for the construction of a municipal plant had been approved, all elections on which we have received reports went against public ownership. Not only that, but in every case the defeat was so overwhelming as to bury the proposal for some time.

Of course, this situation is a reflection of two causes. In the first place, there was little agitation this November because the federal government has ceased to offer grants. In the second place, the voters are beginning to learn that even if they get something for nothing the cost will be more than it is worth. The matter of tax loss is of much more importance than any hypothetical saving in energy cost. There has been enough experience in other places to show what this loss in tax revenue means. In fact, some states have protected themselves against such loss by requiring that any change in ownership or operation will in no way affect the tax revenues.

Without the aid of government subsidy it begins to look as though agitators had very little to offer the voters, and the voters know it.

Kilowatt or Kilowatt-Hour Capacity?

MORE steam plant capacity than that on order will be needed by the utility industry if loads continue to grow at the present pace. Of course, no one can say positively what will happen to those loads in the two years that will be passing while the new capacity is being built. The present large increase in load comes from a revival of power use in industry. It is this industrial load—its duration and its other characteristics—that gives a headache to utility engineers and managers who plan for the future.

Added capacity to take care of increases in commercial and domestic business can be counted upon and stations designed to serve that stable load can appropriately be given high economy because of the assured kilowatt-hours they will be called upon to produce. But some kinds of industrial load come and go and at times are of such magnitude as to add substantially to the system peak. It is reasonable, therefore, to consider added capacity for serving unstable industrial business as peak or kilowatt capacity and to design stations with this situation in mind.

There can be an appreciable difference in cost, performance and layout of a peak-load plant as contrasted with one serving high load factor business, and appreciable savings may be had if the engineers are sure that it is primarily kilowatts rather than kilowatt-hours that are going to be needed.

The older plants which have been held to carry peaks (even if inefficient) are being superposed and modernized so something will have to be provided to compensate for their shift to base-load operation. Nor is there any reason to fear that today's inexpensive peak-load plants might be uneconomical investments, because recent studies seem to indicate that there is, in the long run, little superiority in the over-all cents-per-kilowatt-hour index in the plants which attain high performance results at high unit cost.

Automatic Rate Adjustment

IS IT EVER going to be possible to secure automatic rate changes based on variations in one or more elements of expense? President Kellogg of E.E.I. has suggested that this subject be explored jointly by the state commissions and the electric utilities.

During the last war the utilities saw prices go sky high with relief, if any, long delayed. Today, with greatly reduced rates, there is much less opportunity to absorb higher costs, and therefore any substantial increase in fuel, labor, taxes or interest would soon wipe out any equity return.

It takes no genius to see that with a fixed rate and a variable cost a protracted period of progressive inflation would be ruinous. The commissions are aware of that and several have informally discussed it. The consensus seems to be, however, that the methods employed a quarter of a century ago are adequate to meet today's needs. Moreover, a great many are of the opinion that the laws under which they operate do not give them authority to grant automatic rate adjustments.

Unfortunately a utility cannot go to the courts for relief until it has first been injured. The courts will not order a commission to provide for a situation that has not yet occurred.

In the meantime the utilities have certain measures of relief within their own control if they will but use them. First, there is the well-known coal clause. Second,

there is greater insistence on compliance with power-factor clauses. Third, there is the possibility of writing a tax clause into all long-term contracts. Fourth, new term contracts during the inflation era might be kept to periods not exceeding one year.

These measures, of course, do not affect the residential rate, but is it advisable to have these rates change frequently except under extreme stress? Take a bill in the neighborhood of $1.25, for instance. If this were increased say 4 per cent, how much of the five-cent increase would be taken up in extra billing and collection expense, as well as other incidentals? How, also, would such a percentage be spread over a block rate?

And, finally, since the industry has the threat of propaganda from government-operated hydro systems with no tax problem and, in good water years, no fuel problem, besides having low interest rates, is it advisable to adjust residential rates until all other means have been exhausted?

On the other hand, this does not mean that rate reductions can continue. Already we are seeing the forces of inflation at work, and the longer the war continues the more they will leave their mark on this country. Commissions that believe they must protect the utilities they regulate just as much as the public will see in today's economic signs the necessity for a halt in rate reductions at least until this present storm has blown over.

Labor Laws vs. 24-Hour Service

ELECTRIC service is a 24-hour-a-day job, seven days a week, 365 days a year. There is no time out for electric service, no sick leave, no holidays, no vacation.

That means the employment of an operating force at all times competent to give a degree of service that the utility might be called upon to give. The practice is to break the day into three shifts, but with eight-hour shifts this, of course, means more men to handle the operation for the remainder of the week. There is no standard practice in this respect. Some have fixed shifts, with spare men handling the work during the time off of the regulars. Some have set up extra shifts, with all rotating on prearranged schedules. There are still other ways of handling the operations.

Each time the hours are reduced there is an added difficulty in arranging working schedules, providing for vacations and handling sick leave. When the labor laws were enacted it is doubtful if the difficulties which utilities would encounter, because of 24-hour service, were fully appreciated.

If the utilities were to make a study of this problem and present their facts to the Wages and Hours administration it is not unlikely that some way might be found through reclassification or special dispensation either to improve the present situation or at least prevent it from getting worse.

Unfair Practices in Electrical Construction

TWO WEEKS ago the Federal Grand Jury indicted a number of large electrical contracting companies in Pittsburgh, their principals, the local contractors' association and its officers, as well as three union officials, for conspiracy in restraint of trade and collusive bidding. This is the first batch of indictments to come from federal investigation in 20 cities with respect to unfair trade practices in the building industry as a part of the program of U. S. Deputy Attorney-General Thurman Arnold to reduce construction costs.

Since construction is essentially a local operation, the federal government is handicapped in applying any remedy except as it can show a direct federal interest. For that reason the investigations are limited to PWA projects where federal money has been employed. This, however, should prove sufficient, for if conspiracy or collusion is proved for any class of work the remedial measures should be sufficient to break up illegal activities in other construction handled by the same group.

It is understood that this search for causes of unduly high construction costs will be extended to cover restrictive building codes. While there are many local electrical ordinances that go far beyond the National Electrical Code, it is doubtful if much will be found out of line in the large building field. It is unfortunate that this investigation does not cover the operations most affected by local restrictive electrical codes, namely, residential and other small properties outside the so-called downtown fire zone.

In addition, however, to investigating collusion as between contractors and between contractors and labor, there is need for investigating the practices of labor with respect to factory-wired equipment. When pre-wired equipment is dismantled on the job by labor and there rewound a double cost is created that some one must pay. And not infrequently the rewound equipment is unsatisfactory.

There was a recent case of a piece of intricate control for a large Eastern bridge that was factory wired and tested before delivery. Labor pulled out the wiring and then tried to reassemble the job. Finally, the whole mess was shipped back to the manufacturer to reassemble. By that time it was cheaper to build new.

Wasteful practices of assembly rewiring are going on all the time. Their elimination would contribute to lower building costs.

It is hoped, however, that the government in prosecuting malpractices by electrical contractors will at the same time give some consideration to the destructive competition that was responsible for co-operative action. If the Department of Justice, the Federal Trade Commission or any other government agency had provided contractors with a practical way in which to overcome destructive competition it is doubtful if many of today's malpractices would exist.

A Legacy of Trouble

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

"WE CAN ELECT anybody we nominate in 1940," said a rather shrewd Southern senator to the writer, in discussing the possibility of a third term for Roosevelt. "The important thing is to nominate somebody we can *re-elect* in 1944."

The speaker was not one of the so-called conservative Southern Democrats. It is true that at heart he is a conservative, but he has always gone along with the White House 100 per cent. There was no "purge" in his state in 1938, but he helped crush an anti-New Deal Democrat in an important primary.

The curious part of this political reasoning is where it takes you. For example, one of its premises is that Roosevelt, taking a third term, would not think of taking a fourth. Which is a curious premise, because opposition to a third term, now and all through the history of this country, has been based, at least in part, on the fear that the President getting a third term might take a fourth and a fifth, gradually making himself a dictator who could only be thrown out by a revolution.

Damned Either Way

But passing that objection, the logic would also eliminate Garner. Obviously the Vice-President would be rather well along in years by 1944 to be contemplating four more years in the White House.

All of which runs head on into a line of reasoning which has been very general in Washington among politicians and observers for the last year or so, having developed long before there was any thought that the European war might play hob with political and economic lines inside the United States.

This was that the man elected President in 1940 would be a one termer—that he would run into so much trouble, either carrying on the New Deal policies, or "trying to clean up the mess," as less friendly commentators would put it, that he would be highly unpopular as the end of his term approached. It is amazing how generally this opinion has been, and is, held. It is also of importance that the logic is considered sound by those holding this view, whether the president to be elected is a Democrat or a Republican.

There was just a little straw in the wind a few days ago, when Secretary of the Treasury Morgenthau told newspaper men that the Treasury would issue no checks for federal funds after the debt limit had been passed unless Congress formally raised the debt limitation by repealing the present law. Every one, including Mr. Morgenthau, knows that the federal spending is exceeding receipts by such leaps and bounds that it is not a question of whether the debt limit shall be exceeded, but merely when. And "when" would surely come in the early days of the new administration, even if it is that much deferred.

Of course there are plenty of people, for example Marriner S. Eccles of the Federal Reserve System, who are not disturbed by the debt limit—who think a debt ranging up to 70 billions would not cause any disastrous results.

But it is seldom the truth which is important in politics, so whether Eccles is actually right about this is not important so far as the political outlook is concerned. What is frightfully important is that a great many people are tremendously worried at the notion of taking the lid off the debt limit.

Its mere consideration by Congress, most members believe, would have the effect of giving the country the jitters. Imagine the debates in the Senate which would be headlined in the newspapers, with dire prophesies as to what would happen, and constant pointing to the fact that the policy of spending more than it takes in has been carried on by the government for seven consecutive years (including the last year of Hoover) without making a dent on the unemployment problem, and that even with billions of war orders to stimulate private industry the government has no plans which even lead in the direction of a balanced budget!

Any politician whose business it has been to win elections—as distinguished from appointive officials chosen not for political reasons but because their mental slants appealed to the appointing power—will admit privately that this budget balancing versus debt situation is very likely to ruin the administration of the next president.

If he tries to cut the expenditures down to bearable taxes—nobody doubts they must be raised—he will be ruined by indignant farmers whose AAA checks have been stopped, or by the vast army of reliefers and government employees whose connection with the Treasury has been severed. If he goes right on spending he will be ruined by the vast and growing number of people worried about where the continuance of such a policy is bound to take us.

Will Temper Wind on Utilities

This is not just an academic issue to most senators and members of the House. Leaving out the war, the effects of which on U. S. domestic politics are almost impossible to calculate in advance, this budget-spending-debt thing is the one they are worrying, and talking among themselves, most about.

Nor is the worry confined to the Democrats. Unlike most issues, it is not merely something with which to win an election. It would be a headache *after* the election is won.

It happens that the electric policy which the federal government has pursued in the Roosevelt Administration has been one of the big contributing factors in this whole issue. Had the government, instead of embarking on the yardstick idea, gone

[*Continued on page 107*]

NEWS OF THE WEEK

Consumers Power Opens New 70,000-Kw. Station

Willkie decries persecution of American business as holding back progress — Sees 25 billions of dollars available for new construction — New plant named in memory of Bryce E. Morrow

Intelligent business men know that there is at least 25 billions of dollars to be spent on new construction in this country at the present time—construction that is necessary and that would employ most of the eight or ten millions of unemployed, Wendell L. Willkie, president of Commonwealth & Southern Corp., told members of the Kalamazoo (Mich.) Chamber of Commerce last week.

Speaking at a dinner meeting following the official dedication of the new 70,000-kw. steam generating plant of the Consumers Power Co. on the Kalamazoo River, Mr. Willkie made an appeal for preservation of American principles.

Pointing out that with the relentless persecution business men have been subjected to and the way their democratic rights have been swept aside, Mr. Willkie said that "they either are afraid to venture into this work or cannot get their investors to do so with them.

"There is no way to make capital flow under these circumstances—except through dictatorship. If these circumstances can be eliminated, if these millions of good Americans can be put back into productive labor, American democracy will save world democracy."

Wendell L. Willkie congratulates George F. Stecker (right), general superintendent of electric plant and substation construction, as the first to serve 50 consecutive years with Consumers Power

DEDICATES NEW PLANT—President Wendell L. Willkie and Vice-President Walter H. Sammis of Commonwealth & Southern on an inspection tour of the new 70,000-kw. Bryce E. Morrow station of Consumers Power after its dedication last week

The tremendous public interest in the generation of electricity which can be aroused was demonstrated at the opening of the new steam plant of Consumers Power, a few miles east of Kalamazoo. The plant is named in memory of Bryce E. Morrow, who went to work in the late Thomas A. Edison's shop when he was 14 years of age, became a distinguished engineer, and for many years was chief engineer of Consumers Power and manager of its electric production and transmission department.

Built with a view to future expansion, the plant includes two 35,000-kw. General Electric hydrogen-cooled turbine-generator units. They are the tandem compound, double-flow type and use 850 deg. F. steam at 800 lb. per sq.in. pressure. Each unit has 21 stages. The generators operate at 3,600 r.p.m., producing electricity at 14,400 volts.

Following the dedication ceremonies,

Voters Reject Proposals for City Power Systems

Voters of Arlington County, Virginia, overwhelmingly defeated the proposal to authorize a $1,475,000 bond issue, proceeds to be used for the construction of a municipal electric power system. The vote was 6,139 against and 1,080 for the proposal. The territory, with between 12,000 and 13,000 customers, is served by Virginia Public Service Co., subsidiary of Associated Gas & Electric.

The proposal to issue $3,500,000 in revenue bonds for the construction of a municipal power plant in Ogden, Utah, was defeated 9,507 to 5,780 for the third time.

Municipal ownership won in Provo, Utah, when Utah Power & Light Co., which also serves Ogden, was refused a 10-year franchise extension and voters refused to reverse the 1936 vote, which authorized $850,000 in revenue bonds for a generating plant, now under construction. The vote for the plant was by a 2 to 1 ratio. The city has a PWA grant.

Citizens of Montrose, Colorado, served by Utah Power & Light, defeated the proposal for construction of a municipal power plant.

Chillicothe, Ohio, voters approved a $700,000 purchase of the private plant by the city.

A one-mill levy for electric service expansion was defeated by Cambridge, Ohio.

Ventura, Calif., voters rejected municipal ownership by a 4,575 to 1,482 vote on the proposal for a $1,200,000 bond issue as presented by the City Council following a recommendation by Lester S. Ready, former State Railroad Commission engineer, that the city use the funds to acquire or construct a distribution system.

Voters of Paducah, Ky., turned down by a majority of 3,010 votes a proposed electric franchise ordinance, a referendum on which was forced by the filing of a petition when the city commissioners approved the franchise and offered it for sale last February. It called for the sale to Kentucky Utilities Co. of a 20-year franchise.

Mobridge, S. D., by a 716 to 657 vote granted a franchise to the Dakota Public Service.

Texarkana, Texas, by a 1,190 to 245 vote rejected the City Council proposal for bonds to construct a municipal electric plant. The federal government had offered a $245,000 grant and $350,000 loan for the plant.

Puyallup, Wash., defeated by a 981 to 967 vote, exclusive of 23 absentee ballots, the $350,000 bond issue proposal that the city take over the holdings of Puget Sound Power & Light. Ten years ago a seven to one majority favored the proposal, but the project failed when the city was unable to float the necessary bonds.

---

open house was held for four days, during which time more than 25,000 visitors inspected the modern station and its equipment in operation.

To facilitate progress through the plant a definite course of travel had been laid out and roped off. Placards and diagrams made it easy for visitors to understand the operation of the two 35,000-kw. units and the other equipment. Guides were on hand to answer questions. Walls of the turbine room were lined with exhibits showing developments in lighting, metering and electric transmission. General Electric had some of its marvels from its "House of Magic" on display. Every visitor received a souvenir booklet containing striking pictures of the plant and explanation of its operation.

At the company luncheon George F. Stecker, the first person to serve 50 consecutive years with Consumers Power, was presented with a diamond service pin by Mr. Willkie.

•

Georgia Power Sales

Merchandise sales of Georgia Power Co. for the first nine months totaled $1,498,392, which included $302,628 commercial sales.

Posthumous Award Given to Hirshfeld

Posthumous award of the 1940 John Fritz gold medal, one of the highest honors in engineering bestowed in the United States, to Dr. Clarence Floyd Hirshfeld, who until his death on April 19 of this year was chief of research of the Detroit Edison Co., has been announced by the John Fritz Medal Board of Award. The medal went to Dr. Hirshfeld "for notable leadership through research and development in power generation and electric traction, and for being a great teacher and friend of men both young and old."

Dr. Hirshfeld's career in engineering extended over 36 years and included teaching, writing and direction of research work. In 1913 he organized for the Detroit Edison Co. what is thought to be the first research department established and maintained by an electricity supply company, and became chief of research.

He was the author of many books and articles on technical subjects, dealing principally with thermodynamics, steam power and problems of the transit industry. He was a member of the American Committee of the World Power Conference and of the U. S. National Committee of the International Electrotechnical Commission. He was the first chairman of the Engineers' Council for Professional Development and belonged to many scientific societies, including the Electrochemical Society, A.I.E.E., A.S.M.E., A.S.T.M. and A.I.M.E.

•

Pacific Coast Utility Sets Building Costs

Pacific Gas & Electric Plans New Construction Budget of $25,000,000

Expenditures for new construction next year by Pacific Gas & Electric Co. will approximate $25,000,000, the same as the present level, according to James B. Black, president. In 1938 the company spent about $26,000,000. The new work will conclude the three-year building program as planned.

The company is now constructing three new steam plants on the Contra Costa County shore of San Francisco Bay, each costing $5,000,000 and of 67,000 hp. capacity. Two of these plants, which are near refineries of the Shell, Tidewater Associated and Union Oil companies, will be ready for operation late next summer and the third about midyear, 1941.

A fourth electric generating plant of at least equal capacity will be necessary in 1942, Mr. Black said.

When the three new plants under construction and the fourth projected hydro plant are completed total installed capacity of the system will be 2,000,000 hp.

Mr. Black said that in planning the construction budgets for the next few years the company was making every effort to co-ordinate its building program with that of the Central Valley Project.

•

Operates at Full Load

Montana Power Company's 77,000-hp. Kerr hydro plant is operating at capacity this month for the first time since its completion a year ago. Operation on full base load is expected to continue for at least three months, perhaps permanently.

•

Buys Bonneville Power

A 20-year agreement for the purchase of 750 kw. of Bonneville power has been signed by the city of Forest Grove, Oregon.

Terminal Test Facilities Aid in Locating Faults

Systems operations committee of Pennsylvania Electric Association told that method saves time in repairing defective lines—Engineers discuss problems to increase efficiency of systems

Hours can be saved in repairing defective lines by resort to methods which locate faulty conditions by means of terminal test facilities, which were discussed in detail at a meeting of the Pennsylvania Electric Association's systems operations committee at Pittsburgh last week.

W. D. Wilder reported that Niagara Hudson can locate faults within about 5 miles by studying division between terminal stations of fault currents registered by automatic oscillograph. E. W. Middleton (Penn. Power & Light) uses a ground ammeter in addition on the 220-kv. Siegfried-Wallenpaupack-Roseland line and has located six out of eight faults in 1939 within 5 to 10 miles. The fault locator (see ELECTRICAL WORLD July 20, 1935) used by Pennsylvania Water & Power Co., said G. J. Gross, is locating faults on private telephone lines as well as on the power lines for faults up to 2,000 ohms.

Radio Noises

Interest in war news on foreign-short-wave bands has accentuated noise complaints from listeners, J. G. McKinley (West Penn Power) stated. He described a fault locator for lower voltage lines which employs a set driven from an automobile fan belt and uses frequencies well above the broadcast band.

Voice-recording apparatus for dispatching conversations was discussed by several companies which have been using it for several years. One common difficulty reported is that of low voice level on incoming speech; the automatic volume control still lacks perfection. A check-up on dispatching technique and other educational values was cited as an advantage by W. C. Stone of Public Service Electric & Gas Co. Leased lines give good two-way records on the equipment used by Central Hudson Gas & Electric, according to A. T. Gray. He added that the virtue in the procedure is in the prevention of troubles before they occasion disputes which customary logs fail often to clarify. A. H. Nicholson of Cleveland Electric Illuminating Co. felt that mistakes in operating are more often errors of execution than errors in orders given.

Chairman W. R. Hamilton (West Penn.) showed by charts a close correlation of system load curves with the Dow-Jones average when both are put on a 13- or 26-week running average. This information can be used, he said, to schedule in advance the removal of apparatus for overhaul.

Discussion of problems in connection with regulation of system voltage disclosed that synchronous condensers constitute up to 30 per cent as much kva. capacity as the generators on certain systems. System power factors are running higher, but not generally so high as to create stability problems if generators are kept no higher than 90 per cent power factor. F. Oppenheimer (Penn. Water & Power) showed how the reactors of the sectionalized bus at Holtwood station are used to equalize feeder and tie voltages. T. J. Williams (Ohio Power) cited the instantaneous action of electronic excitation on the hydrogen-cooled condensers. On New England Power condensers are regularly used in "bucking" operation, said C. P. Corey.

•

Raver Against Rush in Signing Contract

A temporary contract for the purchase of 25,000 kw. of power by Portland General Electric Co. from Bonneville Dam probably will be worked out between the parties within the near future, according to reports in Washington. Negotiations for a permanent contract have struck a snag on the question of resale rates, it is said, and the temporary agreement is slated to be concluded until a permanent basis is worked out.

The negotiations were discussed in general by Bonneville Administrator Paul J. Raver during a recent Washington trip when he said he would insist that any savings in the cost of power growing out of the proposed sale be passed on to consumers, no matter what agency serves the city. He asserted that he was "not going to be rushed" into signing a contract with the Portland utility, declaring that six-

Top, l. to r.—F. Oppenheimer, Pennsylvania Water & Power; F. E. McTaggart, West Penn Power; A. C. Hartraupt, Philadelphia Electric; T. C. Montgomery, West Penn Power. Below, l. to r.—A. G. Butler, Duquesne Light; W. R. Hamilton, West Penn Power; W. J. Ellis, Scranton Electric; W. J. Lyman, Duquesne Light; H. L. Wilder, Niagara Hudson; E. W. Middleton, Pennsylvania Power & Light

teen public power systems which now have contracts or are negotiating power contracts with the Bonneville Authority will take all the output presently available.

Mr. Raver said the negotiations with Portland General Electric are a three-cornered affair. The state Utilities Commission has an interest in the projected contract, he said, since it is charged with studying the markets within the state and the necessity for power purchases.

Mr. Raver was in Washington to appear before the Budget Bureau in behalf of a $10,000,000 appropriation for the Bonneville development program for the next fiscal year.

•

Plans 25,000-Kw. Unit

United Illuminating Co. plans a new 25,000-kw. generating unit at the Steel Point station, Bridgeport, Conn. The new unit will consist of a 25,000-kw. turbo-generator and two steam boilers with integral furnaces and auxiliaries. Construction is planned for the spring of 1940 and the plant is expected to be in operation in 1941. Westcott & Mapes, New Haven, are the engineers.

•

Buys 5,000-Kw. Turbine

Decatur, Ind., City Council has accepted a $113,000 bid of General Electric Co. on a new 5,000-kw. turbine for the municipal light and power plant. A $34,000 bid by Westinghouse Electric & Manufacturing Co. on a new condenser was also accepted. Officials stated that work on the $500,000 expansion program would start in the near future.

Iowa City Light & Power Starts $514,000 Expansion

Will add 5,000-kw. turbine and boiler equipment as seven-year battle against municipal agitation ends — Citizens reject federal aid and give mandate for private operation

Last chapter of a successful seven-year battle against municipal ownership agitation that reached national prominence was written when R. B. MacDonald, president of Iowa City Light & Power Co., disclosed plans last week for a $514,000 expansion of the Iowa City generating plant.

Plans call for the addition of a 5,000-kw. steam turbine and boiler equipment to be installed in expanded plant buildings and in operation by late spring, 1940. Turbine and boiler orders have been placed, contracts for building construction will be awarded on November 18 and construction will start November 20, less than two months after the special city election that granted the company a new fifteen-year franchise.

Equipment Rating

The boiler to be installed is a B & W type F spreader-stoker-fired unit generating steam at 400 lb. pressure and 740 deg. temperature. It will have a normal capacity of 60,000 lb. of steam per hour and a maximum rating of 75,000 lb. per hour and will be equipped to burn gas as well as coal.

The turbine is a 5,000-kw. G.E. condensing unit provided with four-point extraction for feedwater heating. The new turbine will more than double the capacity of the plant, which now houses one 3,000-kw. and one 1,000-kw. unit supplied at 150 lb. pressure from boiler equipment of 60,000 lb. per hour capacity.

To accommodate the new equipment two bays will be added to the turbine room.

Litigation over municipal ownership, which later drew the fire of Secretary Harold L. Ickes, started in October, 1932, when the company's application for a renewal of franchise was denied. The franchise expired in January, 1934, and in April of that year a municipal plant for the city was voted by a small majority. Within a short time a grant of $413,000 was forthcoming from the government, followed later by an offer of a $917,000 loan. This loan was rejected by the City Council, but with a change in the Council it was reinstated. Construction of the plant was then enjoined by the power company.

Offered Rate Cut

This maneuvering passed more or less unnoticed by administration public power proponents until July, 1935. At this time Iowa City Light & Power offered its customers a rate reduction on condition that the question of a municipal plant was dropped. The rate reduction was to become effective on the date that the municipal plant was rejected and to be retroactive to the date of the offer, July, 1935. Each month from this time on customers received a note on each month's bill showing the amount of it that would be refunded to them when the municipal agitation was finally settled. It was this offer that drew the fire of Mr. Ickes.

Turning point of the battle came in a March, 1937, city election when a non-partisan ticket, opposed to municipal ownership, was elected and the loan and grant for a new power plant was dropped. At this time the utility refunded, as promised, the $90,000 that had accumulated under the retroactive clause of the rate reduction. Again, in the spring of this year, the proponents of municipal ownership were defeated in a city election and the new officials took this as a mandate from the people opposing public ownership. Consequently, it was not surprising that in a special election on September 26, 1939, a fifteen-year franchise was granted to the company.

WATER HEATERS—Kansas Gas & Electric Co., Wichita, used this effective window display to give impetus to its sales campaign of electric water heaters, tieing in with the Modern Kitchen Bureau's "Time to Change" promotion

Nebraska Power District Signs Energy Sale Pact

Iowa-Nebraska Light & Power Co. to purchase 6,250 kw. of power from Tri-County — President King says contract will materially aid state's irrigation program and farm prosperity

Iowa-Nebraska Light & Power Co., Lincoln, has completed negotiations and signed a contract for the purchase of electrical energy from the Central Nebraska Public Power and Irrigation District (Tri-County). This is the second major power contract signed by Nebraska's "Little TVA." The other contract was between Nebraska Power Co. and the Loup River District.

The Iowa-Nebraska company contracted to purchase up to 6,250 kw. of power at a wholesale rate "considered fair and adequate to all parties to the agreement," L. R. King, president and general manager, said.

Aids State Project

"In purchasing available power from the public power and irrigation project," Mr. King said, "we believe that we are materially aiding the state's irrigation program. Nebraska's prosperity is directly dependent upon a stabilized farm income. We believe that in aiding the public power district to function by purchasing power from it we are helping to bring thousands of potentially productive acres under irrigation at a more economical charge per acre than might otherwise be possible were there no market for the electrical by-product of these irrigation projects."

Mr. King said that the rates to be paid by the company to the district consist of a charge for capacity contracted for plus a charge for energy. For each kilowatt of capacity the charge is $1 per month. The additional energy charge is 4.75 mills per kilowatt-hour for the first block, 4 mills for the second block, and ranges down to approximately 3 mills for larger quantities which the company may buy.

"Our agreement with the Tri-County district will not bring any immediate reduction in operating costs to the company," Mr. King said. Any later savings made through the purchase of power from the district will be passed on to customers, which is in direct accord with the past policy of the company of reducing rates whenever reduced costs of operations make this possible.

The power plants of the Tri-County district are not expected to be in regular operation until some time in 1941, at which time firm power will be delivered to the utility. However, the company will make a connection within a short time with the district's substation northwest of Lincoln so that it may receive any available electric energy from the generating station of the Loup River district at Columbus.

Mr. King pointed out that he considers the completion of the negotiations with the public power district economically sound because it renders unnecessary any duplication of existing facilities, which, through the districts as well as through the company, will mean a saving to the taxpayers and customers alike.

•

Wisconsin Public Service Increases Hydro Power

Energy generated by water power in the first six months of 1939 by the Wisconsin Public Service Corp. amounted to 171,500,000 kw.-hr. as against 97,500,000 kw.-hr. during the comparable period last year. The company attributes the increase to a combination of excellent water conditions together with the addition of generating capacity at Grandfather's Falls station. Steam generation dropped from 39,500,000 in the first six months of 1938 to 20,500,000 in 1939.

Increase in hydro generating was not due entirely to improved river flow conditions prevailing during the late winter and early spring of this year, it was said, but was also made possible by the increased use of electric service. This has meant that during the periods of exceptionally good river flow, following the breakup this spring, the company has been able to absorb water-produced energy which would have gone to waste had business been at the 1937 level.

Plans and specifications for the Hutsonville-Newton and the Hutsonville-Marshall 66-kv. lines of the Central Illinois Public Service Co., Springfield, have been completed and delivered to the contractors for bids. The lines, 37 and 27 miles in length respectively, will provide the interconnection between the new Hutsonville power station, now under construction, and the existing transmission system of the company.

•

LCRA Reduces Electric Rates in 16 Counties

Reduction of rates for electricity furnished more than 20,000 customers in sixteen counties in central Texas has been announced by the Lower Colorado River Authority. Under the new schedule the minimum bill for rural and small-town customers will be $1.25, with an allowable of 15 kw.-hr., compared with existing rates of from $1.25 to $1.50 for ten and $1.75 for 12 kw.-hr.

Construction of lines for the Pedernales Electric Co-operative and the Lower Colorado River Electric Co-operative for further distribution of the hydro-electric power from the plants of the Lower Colorado River Authority will be completed soon, it was announced.

•

BETTER LIGHTING—An increase in inquiries for planned lighting became apparent shortly after the opening of a "lighting school" fostered by the New England Section, I.E.S., and the Massachusetts State Association of Master Electricians. More than 130 Massachusetts electrical contractors have enrolled in the school

Duquesne Light Film Shows Utility Working

In conjunction with its policy of acquainting customers with the equipment and operations necessary to provide electric service throughout its territory in Allegheny and Beaver counties in Pennsylvania, the Duquesne Light Co. has recently released a special sound motion picture entitled "Sun to Sun."

Made entirely in the Duquesne Light territory by a professional producing company, the picture is intended to give the public a much clearer picture of the internal operations of an electric utility company. This picture shows the tremendous investment, numerous and intricate machines and the untiring and devoted personnel which is at all times at their service the instant service is wanted. The picture is a clear, concise story of electric service, from the mining of the coal in the hills of Pennsylvania to the delivery of electricity in the factory, store or residence.

The picture was first presented in previews to sixteen audiences consisting of company employees and their friends. These sixteen showings took place in auditoriums of schools and public buildings in the various sections of Pittsburgh and outlying districts. An enthusiastic reception was accorded all showings.

Duquesne Light is making the picture available for use on the programs of organizations of any type, including clubs, civic organizations, churches, social and service groups, etc. Company employees have been informed that they may book "Sun to Sun" for organizations in which they are interested. Being only twenty-two minutes in length and being of the highest type sound picture production, it fits well into the planned program of any organization. Attractive twenty-page, two-color brochures, showing interesting points of the Duquesne Light Company's system, have been prepared and are being distributed as souvenirs at each showing.

•

North Carolina Develops Rural Electric System

Completion of 1,378 miles of line since July 1 has brought North Carolina's rural electric system to a grand total of 11,788 miles finished and serving 58,804 customers, according to a report issued by the North Carolina Rural Electrification Authority.

In addition, there are now under construction in the state 1,843 miles to serve an additional 7,331 customers, while authorization has been given, but construction has not started, on 2,245 more miles intended to serve another 8,134 customers. When all the lines now under way are authorized the state's total of rural electric lines will reach 15,875 miles, serving a grand total of 79,939 customers.

•

New Farm Booklet

A new booklet, "Farm Help From the High Line," has been issued by Westinghouse Electric & Manufacturing Co. as the main point of a dealer program pointed toward the large farm market. The booklet, among other things, shows how rural electric users have achieved substantial savings through wider use of service.

•

Will Operate New System

Announcement has been made that the Peoples Light Co. of Davenport will acquire and operate the electric distribution system of the Bettendorf Light & Power Co., Bettendorf, Iowa, from the Bettendorf Co., which owns all of the stock of the $50,000 corporation. The purchase price has not been definitely determined.

MEETINGS

Edison Electric Institute—Prime movers committee, Philadelphia, Pa., December 4-5; Detroit, Mich., February 5-6.

American Society of Mechanical Engineers—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., December 4-8. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Seventeenth Exposition of Chemical Industries—Grand Central Palace, New York, N. Y., December 4-9. Charles F. Roth, president, International Exposition Co., Grand Central Palace, New York.

Petroleum Electric Power Club—Eleventh annual conference, Texas State Hotel, Houston, Tex., December 14-15. H. E. Roberts, secretary and treasurer, Box 792, Joplin, Mo.

Louisiana Engineering Society—Annual meeting, St. Charles Hotel, New Orleans, La., January 12-13. A. M. Hill, secretary-treasurer, 422 St. Charles Hotel.

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 22-26. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

American Society of Heating and Ventilating Engineers—Annual meeting and International Heating and Ventilating Exposition, Lakeside Hall, Cleveland, Ohio, January 22-26. Charles F. Roth, president International Exposition Co., Grand Central Palace, New York.

National Electrical Manufacturers Association—Mid-winter Conference, Waldorf-Astoria Hotel, New York, N. Y., February 5-9. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Missouri Association of Public Utilities—Annual convention, Elms Hotel, Excelsior Springs, Mo., April 17-19. Jesse Blythe, assistant secretary, Merchants Bank Bldg., 101 West High St., Jefferson City, Mo.

Electrochemical Society—Spring meeting, Galen Hall, Wernersville, Pa., April 24-27. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Tariff Commission Writes Lamp History

Under the quite unexciting title "Incandescent Electric Lamps" a highly informative little book has been issued by the Tariff Commission. It deserves particularly to be called to the attention of readers interested in any phase of the lamp industry because it comes from a source that is likely to be overlooked by the seeker after this sort of information and is therefore in danger of less extensive use than its excellence merits.

For a long time the "History of the Electric Light," by Henry Schroeder, has been an invaluable source of information in its field, especially for its detailed record of the development of the Edison system. Many things have happened, however, since 1923. The gap was partly bridged by the "History of the Incandescent Lamp," by Howell and Schroeder, in 1927 and there have been increasingly numerous articles, reports and statistics of various sorts, in countless places, on production, imports and exports.

This vast amount of material has evidently been painstakingly culled for the production of the present book of 154 pages, rather modest in size but meaty in content, and conscientiously documented as to sources and dates. The early history is briefly sketched. The treatment broadens as the story comes into the modern period of mass production. Machines are described, commercial and labor conditions discussed, statistics presented. Considerable space is given to patents and licensing agreements. There is a short chapter on mercury and sodium vapor, neon-glow, luminous tube and fluorescent lamps.

•

Appliance Sales Up 34%

Birmingham is 34 per cent ahead in sales of residential electric appliances over last year, according to figures for the first nine months compiled by Birmingham Electric Co. Sales totaled $2,861,161, of which dealers accounted for 97 per cent. Refrigerator sales totaled 6,021, against 4,406; washers 2,364, against 1,761; ranges 776, against 629, and attic fans 175, against 80.

•

I.E.S. Annual Meeting

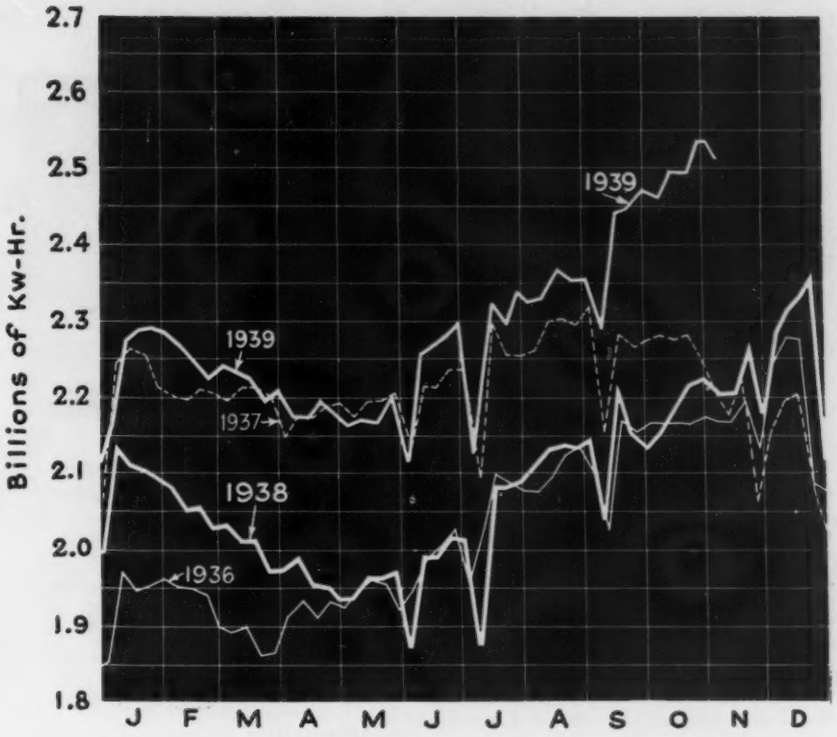
The 1940 annual convention of the Illuminating Engineering Society will be held at the Essex and Sussex Hotel, Spring Lake, New Jersey, September 9-12.

Output Falls Slightly; Still Far Above 1938

Output of energy by the electric light and power industry during the week ended November 11 fell off 0.9 per cent, compared with the preceding week, to 2,513,688,000 kw.-hr., according to the Edison Electric Institute. While the decrease may be ascribed to Election Day, it is to be noted that in the corresponding periods in 1936 and 1928 the curves held their level, although in 1937 there was a decline of 1.8 per cent. The gain over output a year ago was 13.8 per cent—a little less than in the two preceding weeks, but well above the average for the year thus far.

The slight decline did not affect New England, which increased its lead over 1938 to 14.3 per cent, nor the Pacific region, where the gain rose to 10.6 per cent, not matched since the latter part of last August. In contrast, the increase of 8.7 per cent reported for the Mountain states is the smallest since March. Recently it had risen to nearly 25 per cent.

In the South the high rate of increase prevailing during the past couple of months is being maintained with minor fluctuations. The diminution in the national total seems to be due mainly to changes in the Middle Atlantic and Central Industrial regions.



Weekly Output Millions Kw.-Hr.

1939		1938		1937	
Nov. 11	2,514	Nov. 12	2,209	Nov. 13	2,177
Nov. 4	2,537	Nov. 5	2,207	Nov. 6	2,202
Oct. 28	2,539	Oct. 29	2,226	Oct. 30	2,255
Oct. 21	2,494	Oct. 22	2,215	Oct. 23	2,282
Oct. 14	2,495	Oct. 15	2,183	Oct. 16	2,276
Oct. 7	2,465	Oct. 8	2,154	Oct. 9	2,280

Per Cent Change from Previous Year

	Week Ending		
	Nov. 11	Nov. 4	Oct. 28
New England	+14.3	+13.9	+14.1
Middle Atlantic	+11.9	+13.9	+11.8
Central Industrial	+15.9	+18.3	+17.7
West Central	+ 7.2	+ 8.8	+ 8.7
Southern States	+13.8	+14.0	+16.0
Rocky Mountain	+ 8.7	+15.9	+16.1
Pacific	+10.6	+ 9.6	+ 8.2
United States	+13.8	+14.9	+14.0

Washington Water Power Franchise Held Valid

Judge John A. Frater of Seattle has upheld the 25-year franchise granted by the City Council last May to the Spokane Central Heating Company, subsidiary of Washington Water Power Co. The granting of the franchise caused a three-cornered legal battle in which the city sought to have the franchise invalidated.

Judge Frater in deciding the case on "purely legal grounds" said he was "not the least interested in what Grand Coulee Dam may have to do with it, and least of all am I concerned about the political aspect." Indications are that the case will be taken to the higher courts.

•

Orders 25,000-Kw. Unit

Florida Power & Light Co. has placed an order with Westinghouse Electric & Manufacturing Co. for a 25,000-kw. turbo-generator to be installed in its Lauderdale steam-electric station at Dania, Fla. This is a single-cylinder condensing turbine, 3,600 r.p.m., 13,800-volt hydrogen-cooled generator. The plant will be ready for operation in the fall of 1940.

•

Court Upholds Utility in New River Case

The fourth Circuit Court of Appeals has upheld the decision of the lower court denying an injunction to prevent the Appalachian Electric Power Co. from building and operating a power dam on the New River near Radford, Va.

Judge W. Calvin Chestnut, in writing the decision of the court in the case of the now completed $10,000,000 Claytor hydro-electric development, held that the New River was not navigable interstate from Virginia to West Virginia and that building the dam would not impair the navigation of the Kanawha River in West Virginia, into which the New River flows.

The Federal Power Commission had sought an injunction to prevent the construction and operation of the project unless a standard form of license was obtained by the utility.

Buys Power Unit

The city utilities board of Miami, Okla., has purchased a 2,400-hp. Diesel engine for the municipally owned light and water plant at a cost of $140,000. It was stated that the new unit was purchased at this time because of failure to obtain a definite rate for power from the Grand River hydro-electric project.

•

Expands Florida Service

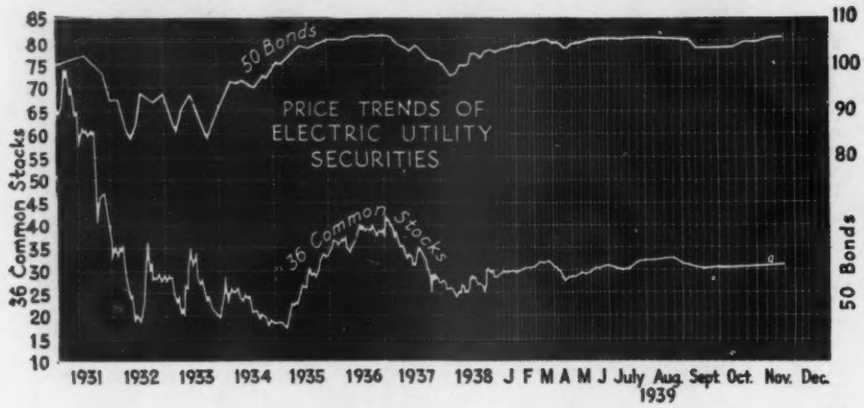
A new 13,000-volt power loop and additional substation and line equipment are being installed by Florida Power & Light Co. in the Daytona Beach area to increase the power supply both on the mainland and the peninsula.

•

Orders New Turbine

Holyoke Water Power Co. has ordered a new high-pressure steam turbine from General Electric Co. for installation prior to the low water period of 1940.

Utility Security Prices Rise Slightly


50 Bonds
PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1931 1932 1933 1934 1935 1936 1937 1938 J F M A M J July Aug. Sept Oct. Nov. Dec. 1939

Electric light and power securities edged upward during the past week. "Electrical World" stock index advanced to 31.7 from 31.6 the preceding week; last year, 29.8. The bond index moved slightly upward to 105.9 from 105.8 last week

Plans to Buy Stock of Subsidiary Unit

North American Co. has filed an application with the SEC regarding the acquisition of a maximum of 2,666,667 shares of $1 par value common stock of its subsidiary, North American Light & Power Co. North American Light & Power proposes to offer 2,000,000 shares of the stock at $1 a share to its common stockholders of record March 5, 1935, and to all common-stockholders of record as of a date to be fixed by the board of directors prior to the making of such offering.

The remaining 666,667 shares are to be offered at $3 a share to common-stock holders of record March 5, 1936 and to all common-stock holders of record as of a date also to be fixed by the board of directors. In accordance with a decision of the U. S. Circuit Court of Appeals of the Second Circuit, the North American Co. will take up any of the shares not purchased by such stockholders.

Wisconsin Michigan Power Co. has filed an application regarding the issuance and sale of 40,000 shares of $100 par value preferred stock, 4½ per cent series, 10,000 shares of $20 par value common stock and $620,000 of 2½ per cent promissory notes.

SEC has issued an order consenting to the withdrawal of the application of Columbia Gas & Electric Corp. for an order declaring it and certain of its subsidiary companies not to be subsidiaries of the United Corp.

•

Will Name Utility Board

A meeting of preferred stockholders and debenture holders of the Utilities Power & Light Corp. will be held on November 20 to elect a board of nine directors for the new company, Charles T. Adams, trustee, has announced. Mr. Adams said a hearing will be held before Federal Judge William H. Holly on confirmation of the reorganization plan for the corporation. This plan, proposed by the Atlas Corp., was approved by the court on November 3 and later by the SEC.

•

Dividends from Capital Limited by SEC Ruling

SEC has announced the adoption of Rule U-12C-3 under the Holding Company Act, prohibiting the payment of principal or interest on any form of indebtedness, which is in effect the payment of a dividend declared out of capital or unearned surplus, without regard to when the dividend was declared, unless approved by the commission.

The rule will affect any company which in the past has declared a dividend out of capital or unearned surplus and has then issued a note or other evidence of indebtedness in lieu of cash payment of the dividend.

•

Byllesby & Co. Is Sued by Mountain States Co.

A decree adjudging H. M. Byllesby & Co. liable for alleged improper profits and for alleged damage and losses sustained by the Mountain States Power Co. is asked in a bill filed recently against Byllesby & Co. in the Court of Chancery, Wilmington, Del. The complainants are Mountain States Power and Benjamin N. Brown of Wilmington, examiner appointed in the Federal District Court in Wilmington for Mountain States Power in 77b proceedings.

Byllesby & Co., according to the complaint, dominated Mountain States Power either directly or through the Standard Gas & Electric Co.

•

West Penn Declared A Holding Company

Maintaining that the West Penn Power Co. could not be held to be predominatingly a public utility company, the SEC denied its application for exemption as a holding company under the Holding Company Act.

The order stated in part:

As of December 31, 1937, the book value of the gross fixed utility assets of the applicant was $108,558,185. As of the same date, the book value of the gross fixed utility assets of its utility subsidiaries was $50,903,093, or 46.89 per cent of the book value of the plant of the applicant. During the year ending December 31, 1937, the utility operating revenues of the applicant (after elimination of inter-company sales) were $21,910,951. During the same period the utility operating revenues of its subsidiaries were $9,230,781, or 42.13 per cent of those of the applicant. Other comparative figures show that the business of the applicant's subsidiaries is a substantial part of the business of the applicant's entire system.

The company argued that special weight should be given to the fact that as of December 31, 1938, its utility assets plus its working capital amounted to $111,487,997, while its investment in its subsidiaries was only $13,099,384. The commission disregarded this argument, contending that control over extensive facilities may be obtained through a minimum of investment. As far as disregarding the Monongahela West Penn Public Service Co. for purposes of the application because the West Penn Co. has committed itself to the sale of the Monongahela stock, the commission said that no definite time had been set for the sale.

Utility Reports

	Net Income 1939	1938
*Alabama Power	$1,652,609	$1,234,884
*Central New York Power	3,386,134	2,834,428
*Cleveland Elec. Illg.	7,528,684	6,511,044
*Commonwealth Edison and subs.	24,158,405	18,563,827
*Consumers Power	9,377,134	9,095,446
*Duquesne Light	10,034,735	8,897,544
*Georgia Power	5,416,674	4,530,015
*Gulf States Utilities	2,497,839	2,031,587
*New York Power & Light	2,524,712	2,752,482
*Niagara Falls Power	2,529,996	3,206,870
*Ohio Edison	2,350,907	1,898,363
*Pennsylvania Electric and subs.	1,964,083	1,635,803
*Puget Sound Power & Lt. and subs.	2,034,636	1,471,532
*Virginia Electric & Pwr.	3,827,702	3,422,972

*Twelve months ended September 30.

Now COBALT TUNGSTEN

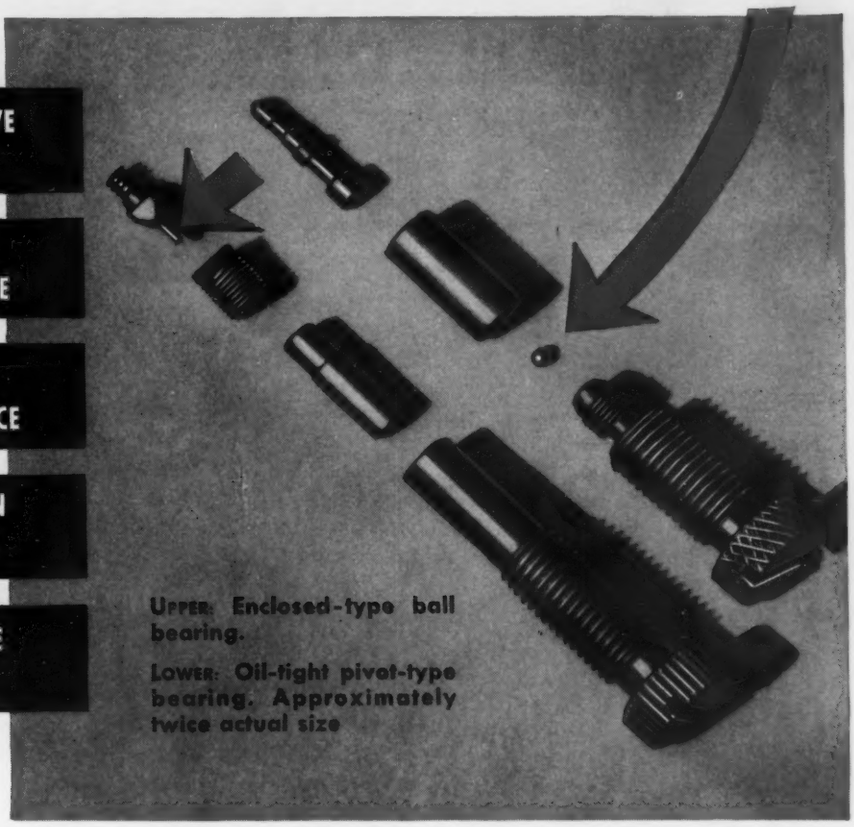
NO ABRASIVE OXIDES

LESS WEAR LONGER LIFE

MINIMUM MAINTENANCE

PROTECTION OF JEWELS

LONG-TIME ACCURACY



UPPER: Enclosed-type ball bearing.

LOWER: Oil-tight pivot-type bearing. Approximately twice actual size

Standardized for Bearings in G-E Watthour Meters

In G-E watthour meters, cobalt tungsten is now standard for:

1. **The ball in ball-type bearings (used without oil)**
2. **The pivot in pivot-type bearings (with oil-tight jewel screw)**

You have the choice of either bearing in a G-E meter—at the same meter price.

COBALT tungsten is a G-E patented nonferrous alloy. Months of development work were devoted to solving the manufacturing problems of producing the cobalt-tungsten ball. But that the effort was decidedly worthwhile can be judged by the benefits derived from the use of this special alloy.

NO ABRASIVE OXIDES

Chief among these is the fact that cobalt tungsten does not produce abrasive oxides, which in either the ball-type or pivot-type bearing eventually cause wear and lead to ultimate bearing failure. This adds to the life of the bearing and reduces maintenance to the minimum.

PROTECTS JEWELS

To withstand the shock impressed on the bearing where a meter is subjected to excessive current surges due to short circuit, cobalt tungsten is ideal: it is soft enough not to crack the jewel; it is elastic enough to withstand the pressure without permanent deformation.

REPLACEMENT PARTS

Cobalt-tungsten balls and pivots for replacement purposes are available. Orders for them may be placed directly with the nearest G-E Sales office. General Electric, Schenectady, N. Y.

1889 1939

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

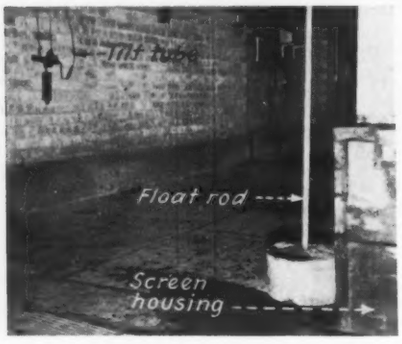
GENERAL ELECTRIC

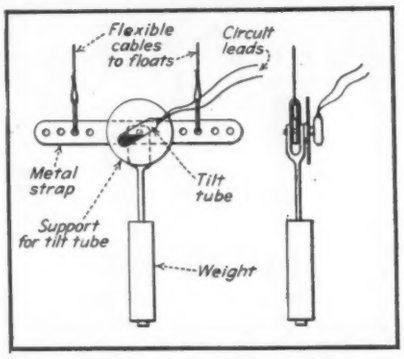
400-39

OPERATING PRACTICES

Signal Scheme Warns of Fouled Trash Rack

Sudden accumulations of refuse, fish, weeds or other matter on trash racks or traveling screens, if they pass unnoticed, may seriously menace condenser water supply and can conceivably cause partial loss of load if not caught in time. To avoid such an eventuality at the Port Washington plant of the Wisconsin Electric Power Company an alarm system has been devised to warn the operator when such conditions arise. The alarm is actuated by any drop in water level across the traveling circulating water screens.





Tilt tube operating on difference in water level warns of clogging of traveling circulating water screens

The scheme used is simple but effective. Cables attached to floats on each side of the screens pass over a series of pulleys and down to a short metal strap to which a mercury tilt tube is attached. The strap is weighted to keep the cables tight. When water level is the same on both sides of the screen the metal strap is horizontal and the mercury tilt tube in the open circuit position. As water level drops on the condenser side of the screen with respect to the level on the lake side of the screen the strap is tilted by the action of the floats and the mercury tilt tube changes position, closing an alarm circuit to notify the operator.

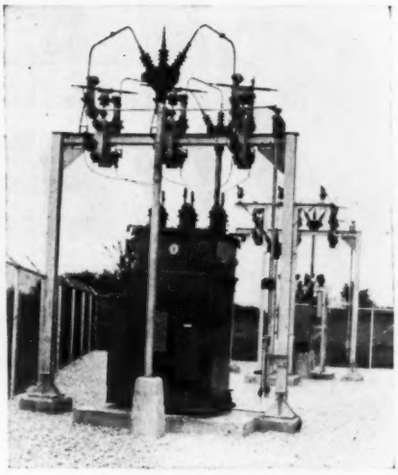
The system at Port Washington was installed to prevent occasional large schools of fingerling fish from cutting down the condenser water supply. To date its operation has been most successful according to the plant engineer.

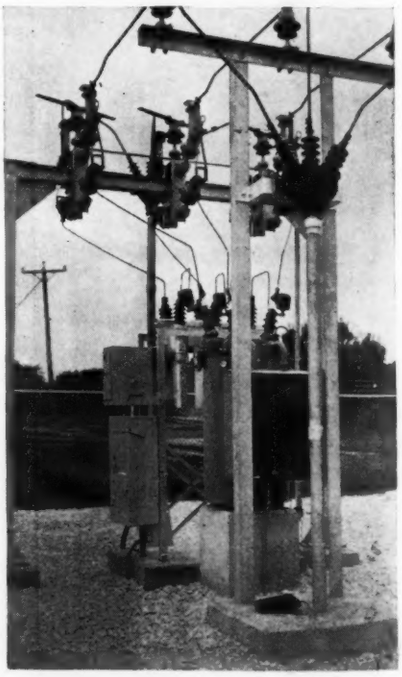
•

Station Arrangement Flexible—Sightly

Paxton substation of the Central Illinois Public Service Company, Springfield, completed last fall, and Gilman substation, completed this year, both feature a unique arrangement of regulators, breakers and metering equipment on 11-kv. outgoing lines.

Use of self-contained regulators, breakers and metering equipment connected through trench-lay cable terminating in potheads on the simple steel structures shown resulted in a construction for which the follow-





Trench-lay cable and self-contained equipment contributes to simple, compact and sightly substation construction

Top—Feeder regulator with simplified structure for by-pass. In background is breaker and metering equipment. Below—Close-up of breaker and metering.

Now a 15-kv Pyranol FILLED CURRENT TRANSFORMER

General Electric's Type KF-305

NOW, for the first time, you can get a 15-kv outdoor current transformer of the porcelain-shell type, Pyranol filled. With General Electric's new Type KF-305, these construction advantages—formerly available only in the higher ratings—have been extended to the 15-kv class.

Decreases Hazards

Pyranol is a G-E noninflammable, nonexplosive insulating liquid that is chemically stable—and the Type KF-305 is Pyranol filled. Pyranol has high dielectric strength. It will not sludge, and it presents no fire hazards. Furthermore, it's hermetically sealed in the case—no moisture can get in, no liquid can get out.

Smaller and Easy to Handle

The Type KF-305 transformer is small and easy to handle. Its porcelain-shell-type construction makes reduced dimensions possible. Its convenient shape simplifies mounting in the structural framework.

High Accuracy and Better Performance

Moreover, the new Type KF-305 meets the NEMA accuracy classification of $\frac{1}{4}$X, $\frac{1}{4}$Y, $\frac{1}{4}$Z and the 4.5-inch impulse test-gap requirements of the ASA. These are just two of the stringent tests that these new transformers pass in order to increase your assurance of a better, more dependable transformer.

For further information on the features of these new transformers, ask for our descriptive bulletin GEA-3264. You can get a copy by calling your nearest G-E office or writing General Electric, Schenectady, N. Y.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

420-55

ing advantages can be listed: (1) Eliminates extensive steel and bus work. (2) Is very flexible, permitting units to be relocated with practically 100 per cent salvage value. (3) Eliminates large number of unsightly aerial feeders through use of trench-lay cable. (4) Cables permit equipment to be located at some distance from main substation, allowing room for future feeder breaker and metering equipment with no change in bus structure.

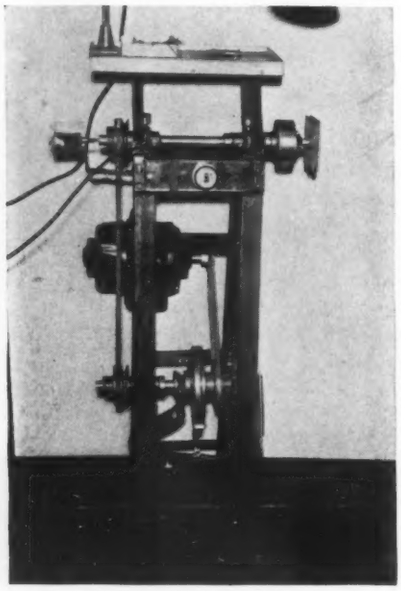
Instead of regulating voltage with the conventional type installation, using three induction voltage regulators with exciting transformers, outdoor type instrument transformers, auxiliary transformers, a large steel structure and extensive bus work, a completely self-contained 12,000-volt modern step-type regulator was used.

A very simple structure, carrying a modern unit-type by-pass, is used with the step regulator, which is connected to the transformer bus through cable and potheads in a single conduit riser, as shown in an illustration. A second cable and set of conduit risers connect the regulator to the oil circuit breaker and metering equipment some 50 ft. from the regulator as shown in the second picture. The breaker is an outdoor frame-mounted type with separate oil tanks for each phase and equipped with an automatic three-shot reclosing mechanism. The metering equipment is the unit type with current and potential transformers submerged in transformer oil. The steel structure and by-pass unit are similar to those for the regulator, but are so arranged that one by-pass unit serves to pass both the breaker and metering unit. From this structure trench-lay cable, conduit risers and potheads connect the breaker with the aerial line.

In addition to advantages listed previously the use of trench-lay cable, buried directly in the earth, eliminates need for steel conduit except in risers that support cable and potheads.

•

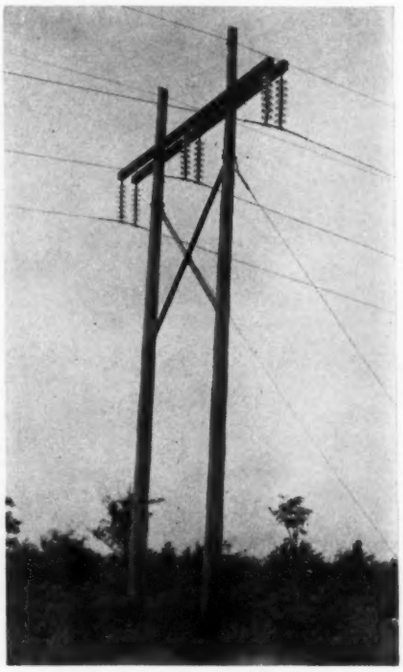
Inexpensive Coil Winder



Coils of any size and shape can be made on an inexpensive winder built from spare parts at the motor rewinding shop of the Gary (Indiana) Heat, Light & Water Company for use during the frequency change-over operations currently in process on the company system. Shape of the coils wound on the machine is readily changed by shifting the location of pegs in the parallel fibre plates of the winding head. A variety of heads are used with the machine for making large and small coils and are attached to the machine with a regular lathe chuck. A treadle-operated clutch controls the winding shaft, which is provided with a revolution counter for indicating the number of turns on the coil.

Material Minimized at Highway Crossing

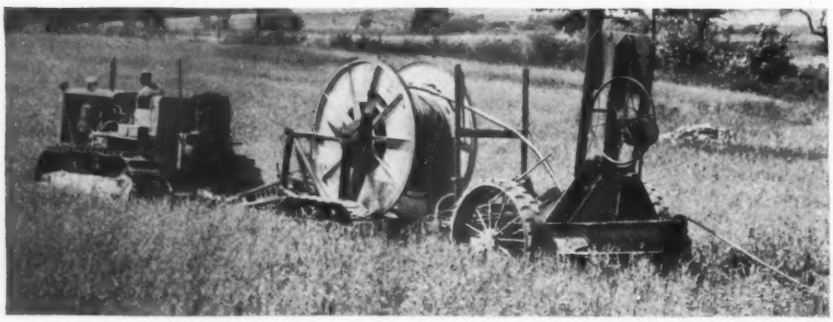
In place of an elaborate set-up of multiple poles, strain insulators, pole guys and other elements often used in high-voltage transmission construction at highway crossings, the above structure employed by the Plymouth County (Mass.) Electric Company on the new 114-kv. line tying the New Bedford area into the Cape Cod district has been used to simplify the layout without sacrificing safety. The design resembles the standard H-frame construction used on tangent sections of this line, but on account of the road crossing two crossarms were used, the power conductors being carried by vertically hung glass insulator strings of seven disks each, with short ties between the points of conductor suspension as shown. No angular hung strain disks were required and no jumpers were provided to loop around the ends of the span.



Economical pole structure at road crossing

The power conductors are No. 4/0 ACSR and there are two static wires of $\frac{3}{8}$-in. Copperweld high-strength design, with a $\frac{3}{8}$-in. Bethanized steel continuous counterpoise. The insulator disks are 10-in. units, normal pole

Fast, Economical Cable-Laying Plow

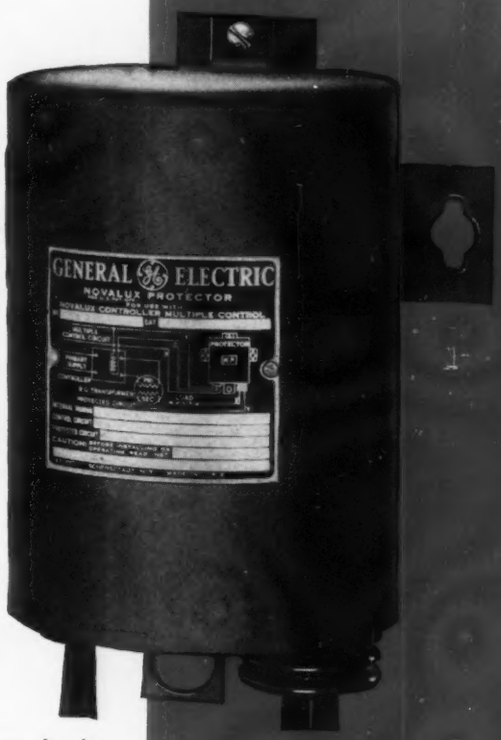


Specially built cable laying and plowing machine, pulled by Caterpillar tractors, lays 3 to 4 miles of cable 30 in. underground in eight hours, in spite of hilly and thickly wooded country, for the New York Telephone Company between Binghamton and Elmira. Each tractor uses about 3 gal. of fuel per hour.

NEW NOVALUX PROTECTOR

FOR SERIES STREET LIGHTING CIRCUITS

to Safeguard Personnel and Equipment



WHAT do you want in protective equipment for your series street lighting circuits? Safety, of course, and performance and dependability. You get all three when you install the new isothermic Novalux protector.

Open circuits in the secondary of series street-lighting systems are unavoidable especially on aerial circuits. When they do occur, it is desirable to disconnect the constant-current transformer with a quick-acting protector. Hazards to both employee and public are minimized; transformers, cable, and luminaires are not subjected to the higher open-circuit voltages. Protective equipment saves you money, too, by permitting the use of lower-cost cable. Now cable can be selected for normal operating voltages instead of open-circuit conditions.

A new circuit development has made possible the construction of a dependable protector with few moving parts. Important features include an isothermic circuit breaker that trips independently of reset lever and cannot be reset while a circuit fault remains.

There is a type available for either multiple or series control. If you would like further information about them, write your G-E office or send the coupon to General Electric, Schenectady, N. Y.

EASY TO INSTALL—because the mounting bracket can be bolted to the cross arm or bent around the pole. Leads are plainly marked; connection diagram is stamped on the nameplate.

OPERATING TIME UNAFFECTED BY TEMPERATURE—because the protector is isothermic and operates in air. There are no dashpots or oil to become sluggish in cold weather.

EASILY RESET—by hand or with switch hook. It is necessary only to pull the reset lever down; then push up.

VISIBLE INDICATION—of protector position is provided by reset lever.

General Electric, Department 6A-201
Schenectady, New York

Please send me a copy of your publication GEA-3338 on "The Isothermic Novalux Protector."

Name .....

Company .....

Street ..... *State* .....

City .....

500-379

GENERAL ELECTRIC

separation in the H-frame, 12 ft., conductor spacing 12 ft. on centers and static wires 9 ft. above conductors, with an average span of 570 ft.

•

Install Limiters on Secondary Networks—I

By C. P. XENIS and E. WILLIAMS
Consolidated Edison Company of New York, Inc.

ED. NOTE—The operation of limiters to prevent the spread of cable faults on secondary networks, as well as the philosophy of their application, has been told previously in ELECTRICAL WORLD (October 7, 1939, page 46 and October 21, page 51) by Messrs. Xenis and Williams. Now, in a series of four articles to appear in the Operating Practices section, the authors will detail their construction and the construction procedure for preinsulated fusible and non-fusible crab joints. In all this work the compression type of electrical connection is used, as described by Messrs. Williams and Metcalf in ELECTRICAL WORLD for January 15, 1938, page 128.

On a.c. and d.c. secondary mains the limiter with rubber sleeve is inserted in the mains cable, non-leaded, rubber-insulated lead-covered and paper-insulated lead-covered. When the limiter is installed on paper-insulated cables an oil seal is necessary to prevent the migration of insulating compound from the cable into the body of the limiter assembly where it would cause deterioration of the rubber sleeve over the limiter.

The construction procedure follows:

1. Cut back lead sheath.
2. Remove insulation and clean strands thoroughly.
3. Remove all braids and tapes.
4. Slide rubber sleeve over cable before installing fusible connector.
5. Clean lead sheath.
6. Install fusible connector with press. Make one indentation for No. 4/0 or 200,000-circ.mil cables and two indentations for 350,000 or 500,000-circ.mil cables. Confine indentations to length "W" when oil seal is required.
7. Leave this section of connector free of indentations to permit oil seal.
8. For paper-insulated cable fusible connector must have this barrier to provide an oil seal.
9. Install oil seal as follows:

A. Apply thin, even coat of G.E. No. 1201 "Glyptal" lacquer to exposed paper insulation and allow to set until tacky (about two minutes).

B. Build up between lead sheath and end of fusible connector (1½ in. length) with ¾-in. silk tape. Apply thin, even coat of Glyptal lacquer to lead sheath, silk tape and fusible connector (3½ in. length) as shown and allow to set until tacky.

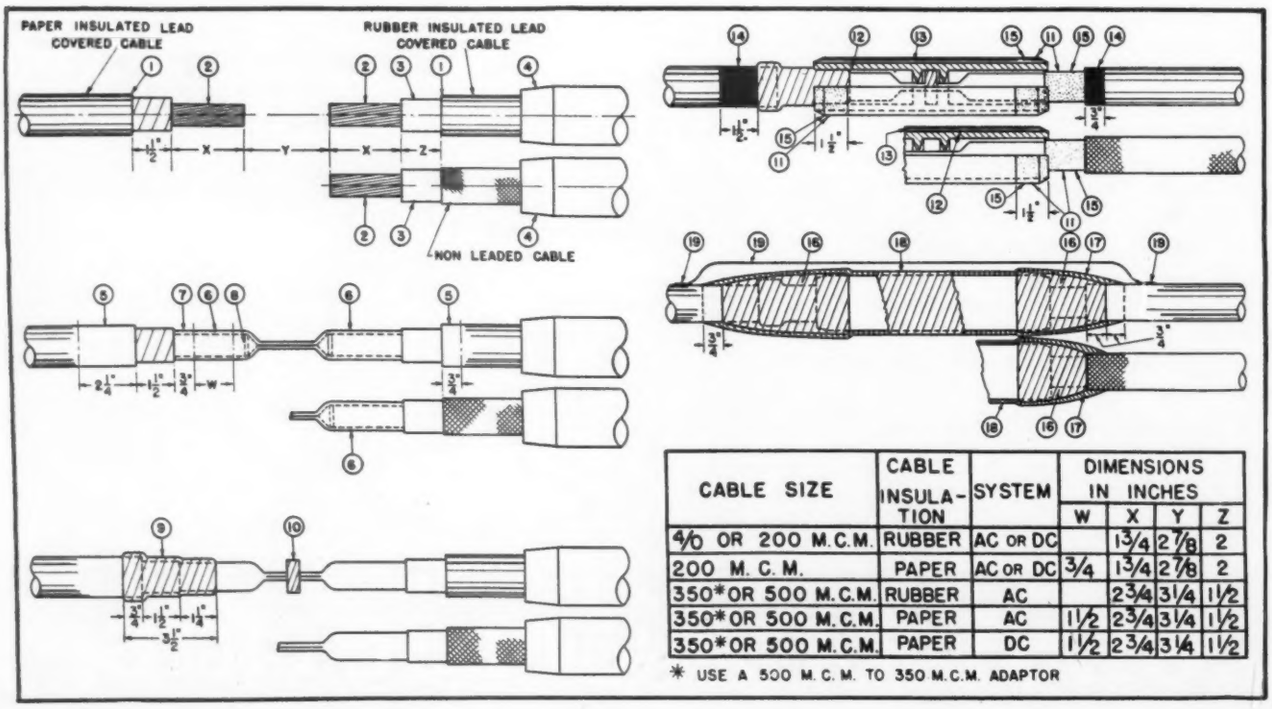
C. Cover with one half-lap layer of silk tape and apply thin, even coat of Glyptal lacquer. Allow to set until tacky.

D. Apply three more half-lap layers of silk tape and Glyptal lacquer, allowing each to set until tacky before applying the next layer. Apply Glyptal lacquer to the last layer of silk tape.

10. On d.c. system only—Wrap center of fuse section tightly with ½ x 1/32-in. asbestos tape, forming a collar to fit snugly inside of limiter shell.
11. Roughen rubber with abrasive cloth.
12. Place halves of limiter shell over connector and bind together with friction tape. Center shells over fusible connector.
13. Slip rubber sleeve over limiter shells.
14. Apply thin, even coat of rim cement and allow to dry one minute before applying tape.
15. Apply thin, even coat of rim cement. Brush off excess cement and allow to dry one minute before applying tape.
16. Apply Kerite tape or Uskorona tape half-lapped with sufficient tension to reduce its width from ¾ to ½ in. Tape required at each end: 200,000 circ.mil or No. 4/0 cable, 12 feet (approx. ½ roll); 350,000 or 500,000-circ.mil cable, 19 feet (approx. ¾ roll).
17. Apply two half-lap layers of friction tape. Apply friction tape over Kerite tape or Uskorona tape with considerable tension in order to compress under layers of tape.
18. Cover complete joint with one coat of rubber expansion joint paint (U. S. Rubber Products Co.).
19. Install No. 6 bonding ribbon; solder to lead sheath. When joining non-leaded cable to lead-covered cable, connect lead sheath of lead-covered cable to secondary neutral with No. 6 bonding ribbon.

Construction Notes

1. When joining paper-insulated cable to paper-insulated cable follow construction methods shown on left side of drawing.
2. When joining rubber-insulated cable to rubber-insulated cable follow construction methods shown on right side of drawing.
3. When joining paper-insulated cable to rubber-insulated cable follow construction methods shown on left side of drawing for the paper-insulated cable and methods shown on right side of drawing for the rubber-insulated cable.



CABLE SIZE	CABLE INSULATION	SYSTEM	DIMENSIONS IN INCHES			
			W	X	Y	Z
4/0 OR 200 M.C.M.	RUBBER	AC OR DC		1¾	2⅞	2
200 M. C. M.	PAPER	AC OR DC	¾	1¾	2⅞	2
350*OR 500 M.C.M.	RUBBER	AC		2¾	3¼	1½
350*OR 500 M.C.M.	PAPER	AC	1½	2¾	3¼	1½
350*OR 500 M.C.M.	PAPER	DC	1½	2¾	3¼	1½

* USE A 500 M. C. M. TO 350 M.C.M. ADAPTOR

Limiter installation procedure on a.c. or d.c. secondary mains

For Only $8876 this Utility Released Substation, Transmission, and Distribution Capacity Worth $60,000

HOW G-E PYRANOL CAPACITORS SAVED CAPITAL INVESTMENT FOR A MASSACHUSETTS POWER COMPANY

DURING 1936, customer requirements of this company were such that substation, transmission, and distribution facilities were loaded beyond safe operating conditions; also, in some locations voltage drop was excessive. Because of load conditions on circuits in the center of the city, no spare capacity or standby capacity was available.

After a thorough study, the company's engineers selected distribution capacitors as the speediest and most economical method of correcting these conditions.

Accordingly, 1100 kva of G-E Pyranol capacitors* were installed on the distribution feeders, raising the power-factor from 76 per cent to 86.5 per cent.

As a result, voltage conditions were improved on the entire system, and the feeder capacity released amounted to the equivalent of one complete circuit. The amount of substation, transmission, and distribution capacity restored to revenue production, was 1200 kva. In addition, a considerable amount of generator capacity was made available for load growth.

The 1100 kva of Pyranol capacitors cost $8876 installed. Compare this amount with the cost of substation, transmission, and distribution facilities. Even at the conservative evaluation of $50 per kva, the capacity released by capacitors would be valued at $60,000.

*Of this total, 700 kva were installed in 1937, 400 kva in 1938.

CAN CAPACITORS SAVE FOR YOU?

Yes, if low power-factor is overloading your generating equipment, substations, or feeders with reactive kva, you can profitably apply G-E Pyranol capacitors. In many cases, the cost of the capacitors will be less than one year's carrying charges on other types of equipment which you might use to correct overload conditions. Find out for yourself the advantages of this low-cost method of gaining system capacity. Ask your G-E representative for complete information, or write for Bulletin GEA-2746, "Pyranol Capacitors for Central Station Applications." Address General Electric, Schenectady, New York.

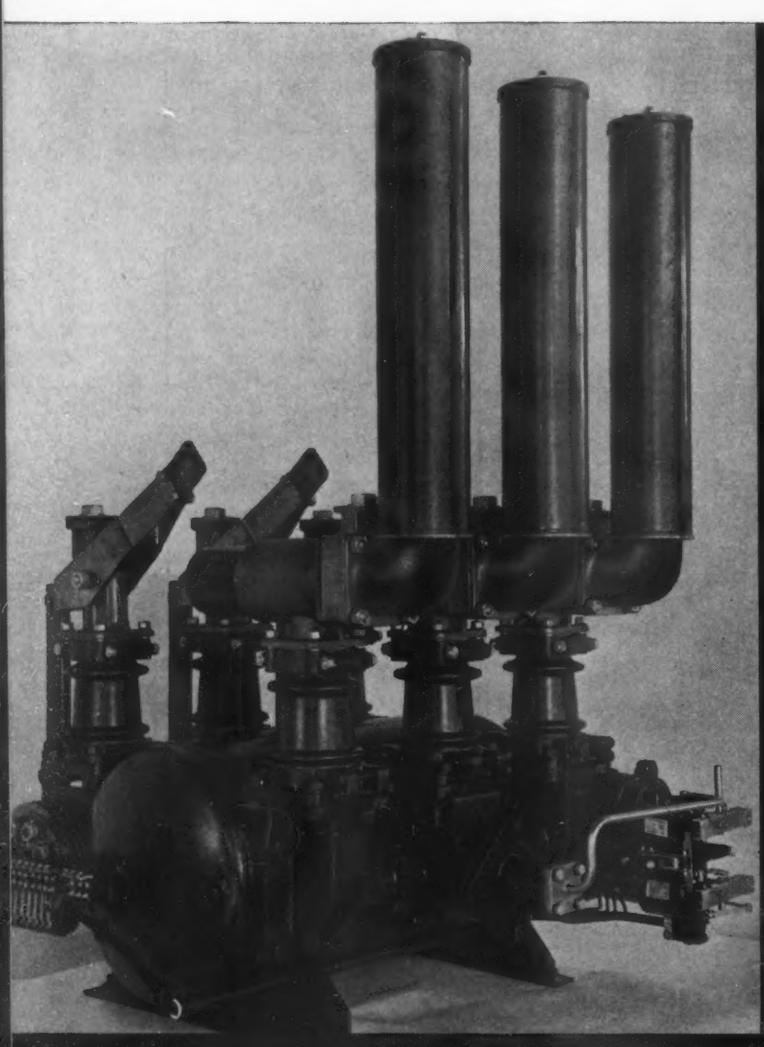
HOW RELIABILITY IS BUILT INTO G-E PYRANOL CAPACITORS

The dielectric characteristic of Pyranol—noninflammable liquid dielectric used in G-E capacitors—must conform to rigid standards. In the final check, illustrated at the left, samples of Pyranol are bled from the main line leading from the storage tanks to the treating tanks and heated to a predetermined temperature in a special cell, with electrodes immersed. Careful testing and control of materials contribute much to the performance record of Pyranol capacitors—over 99.8 per cent perfect.

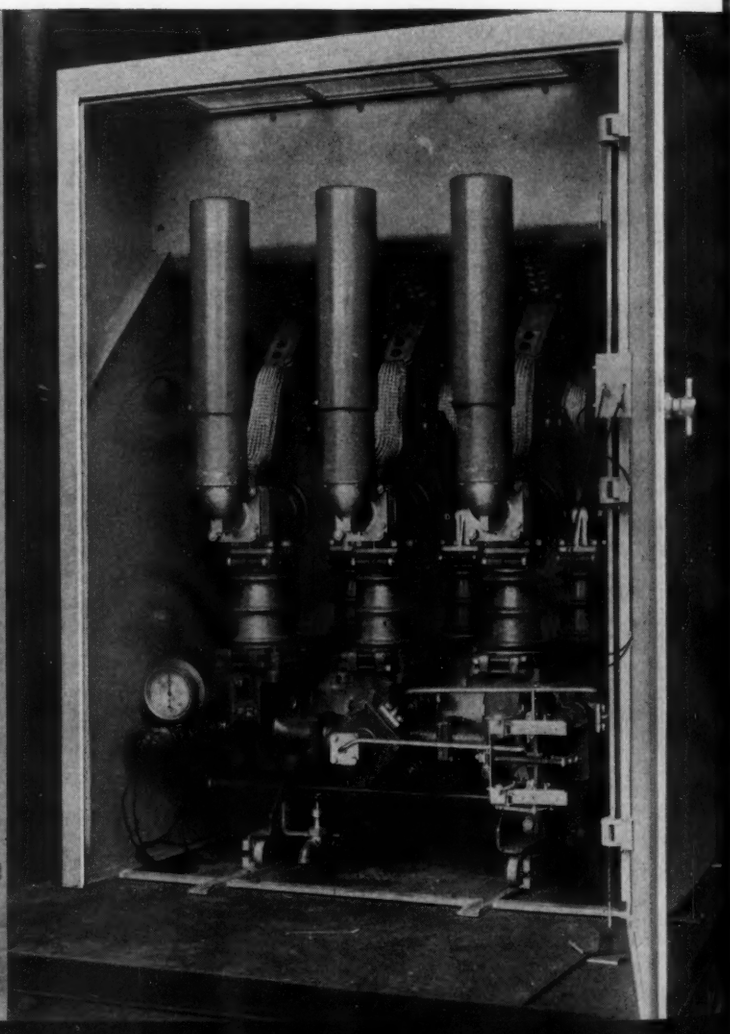
GENERAL ELECTRIC

360-149

ANNOUNCING



250,000 KVA, 15,000 VOLT ALLIS-CHALMERS INDOOR Air Blast Circuit Breaker for application in cells, cubicles and metal-clad switchgear.



TESTING AN INDOOR AIR BLAST CIRCUIT breaker in the high voltage laboratory. Breaker rated 1200 amp, 15 kv, interrupting capacity 500,000 kva.

Over 90 Years of Engineering Superiority Work for You When You Specify Allis-Chalmers!

ALLIS-CHALMERS A-C MILWAUKEE

... THE NEW ALLIS-CHALMERS AIR BLAST CIRCUIT BREAKERS!

Climaxing several years of exhaustive research and testing . . . paralleled by field trial installations . . . Allis-Chalmers now offers indoor Air Blast Circuit Breakers for cell, cubicle and metal-clad mounting.

The Allis-Chalmers Air Blast Breaker makes its debut . . . but only after Allis-Chalmers engineers have proved its ability to deliver satisfactory service under the most arduous demands of American power systems.

With the introduction of the air blast breaker, new fields in circuit protection are open. By using the pre-stored energy of compressed air for the two-fold function of contact operation and circuit interruption, a guillotine-like form of arc interruption has been attained . . . giving you shorter interrupting and arcing times . . . longer contact life!

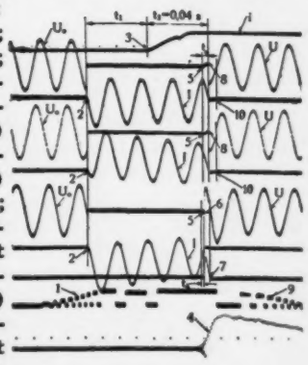
Get Added Protection!

The Allis-Chalmers Air Blast Circuit Breaker operates independent of the rate of rise of recovery voltage. Now you can control this factor that has always been a system trouble-maker . . . get added protection for your system!

Indoor breakers will shortly be available for 150,000 and 250,000 kva at 15,000 volts and 500,000 kva with 23,000 volt insulation for operation at 15,000 volts. Larger sizes and higher voltages will follow.

Find out how you can get improved system stability...recovery voltage control . . . circuit protection and safety of operation with the new Allis-Chalmers Air Blast Circuit Breaker! For the complete story on air blast breakers, call the district office near you or write direct to Allis-Chalmers, Milwaukee.

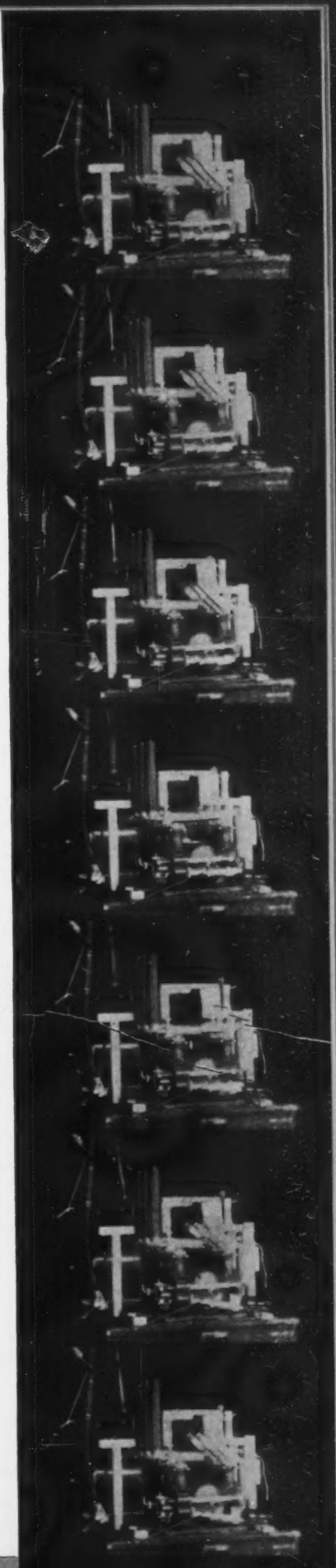
Oscillographic Test Record of Air Blast Breaker Interrupting 43,000 Amperes at 8100 Volts.



(1) disconnect contacts close; (2) short starts; (3) trip coil energized; (4) air pressure (135 or 225 lb) rises in interrupting chamber; (5) contacts separate; (6) point of interruption of current in first phase interrupted; (7) point of interruption of current through resistor in first phase interrupted; (8) interruption of shorts in phases 2 and 3; (9) disconnect contacts open; (10) point of interruption of current through resistors in phases 2 and 3.

t_1 = relay time; t_2 = interrupting time; t_3 = arcing time, first phase interrupted; t_4 = arcing time, second and third phases interrupted; i = breaker coil trip current; U = voltage; I = short-circuit current.

A-1167



MOVING PICTURE RECord of 250,000 kva Allis-Chalmers Air Blast Circuit Breaker closing the short circuit and interrupting 13,200 amperes at 11 kv during test.

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

INDUSTRIAL ENGINEERING

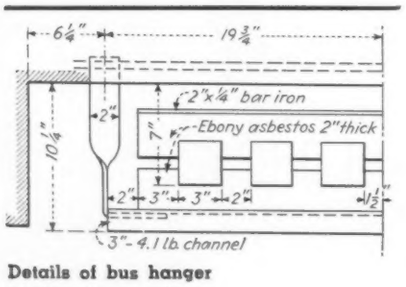
Braze Tube Bus With Low-Melt Alloy

Ventilated square tube copper bus, joined with a low melting point brazing alloy, solved the problem of high current-carrying capacity and space limitations imposed in a recent bus modernization at B. Altman & Company, Fifth Avenue department store in New York City.

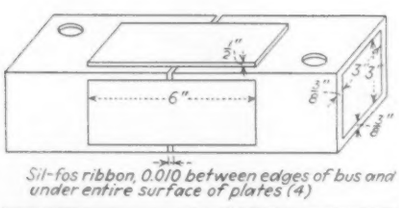
Change in the source of power supply necessitated moving the older bus run—lead-covered cables run under the floor—from the switchboard to two 450-kw., 120-volt d.c. generators.

Study of the problem showed that an installation of square tube bus (two conductors and an equalizer for each machine) would require only 40 per cent of the space needed for flat bar bus. Furthermore, using the square tube bus, the two runs—six busbars—would fit into the same horizontal distance, 39 in., needed for one run of flat bar bus. A comparison of fabrication and material cost showed that a square-tube bus installation would cost $4,600, as compared with $6,300 for the alternate method.

Brazing square-tube bus with Sil-Fos—low-melting alloy of copper, silver, phosphorus



Details of bus hanger
Half of hanger shown

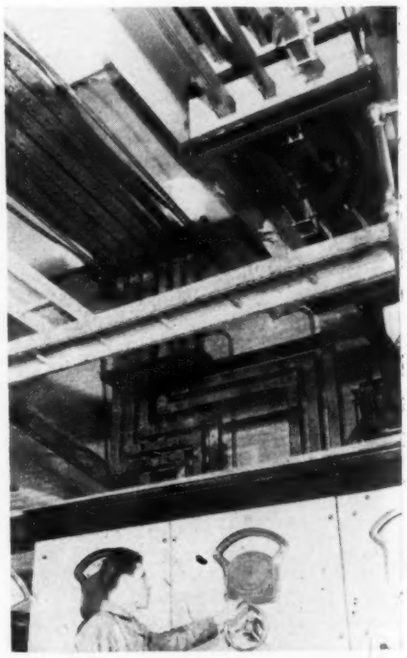


Details of brazed joint

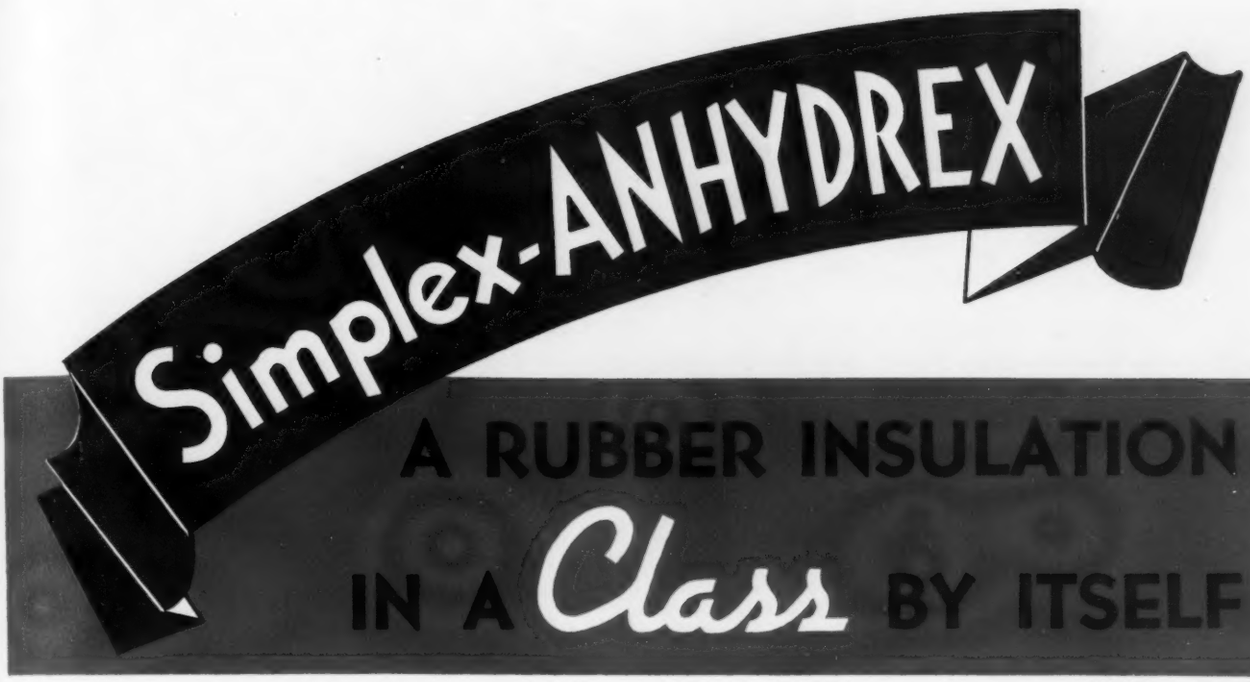
Standard lengths of 25-ft. Chase 3-in. square tube bus are used. From the switchboard to the generators it is 78 ft., there is a vertical rise of 12½ ft. at each end, and a short horizontal run of 23 ft. is necessary to reach one generator. Midway of the run a Burndy braided copper connector provides for an estimated 2 in. of maximum expansion. Four of these connectors are bolted on each conductor, with two on each equalizer. Where they are used, a small block of "Transite" is inserted in the tube as an additional brace.

The bus is ventilated top and bottom with 1¼-in. diameter holes, which are staggered and spaced four inches between centers, with six to the foot. Following the brazing, the conductors were coated with "Tornesit," a lacquer which provides added cooling. At three-quarters load and room temperature the conductors were barely warm to the touch. On test at 78 deg. F. the painted bus rose 17 deg. C. while carrying a full load of 3,300 amp. d.c.

Because of the increased conductivity and lowered resistance it provided, together with ease of application, Sil-Fos brazing alloy (15 per cent silver, 80 per cent copper, 5 per cent phosphorus) was used to join the lengths of buses. After the edges of the tubes were squared the surface was cleaned and fluxed. Flat plates were clamped over each face of the bus, with the ribbon form of the alloy between the plates and the bus. Tubes were then heated by acetylene torch to 1,300 deg. F.



Close-up of square-tube and flat bar buses shows space saving of new installation



ANHYDREX is the first and only waterproof rubber insulation.

Simplex-ANHYDREX is a modern insulation in every sense of the word. Laboratory tests demonstrate that Simplex-ANHYDREX deproteinized rubber insulation will absorb only .010 grams of water per square inch of exposed surface when soaked for seven days in water at 158°F.

No corrosion, no sheath currents, no electrolysis, no water absorption troubles, these together with the fact that Simplex-ANHYDREX power cables can be easily installed or jointed are the biggest selling points for Simplex-ANHYDREX deproteinized rubber insulation.

Up-to-the-minute cable users who are abreast of modern development have recognized the superiority of Simplex-ANHYDREX deproteinized rubber insulation. If you feel that you, too, do not need to be tied to convention and tradition, we will be glad to send you the latest book (July 1939) on ANHYDREX rubber insulation. It will give you many interesting facts that may be new and certainly will be helpful. A card will bring this new book.

Simplex Wire & Cable Company, 79 Sidney Street, Cambridge, Mass.

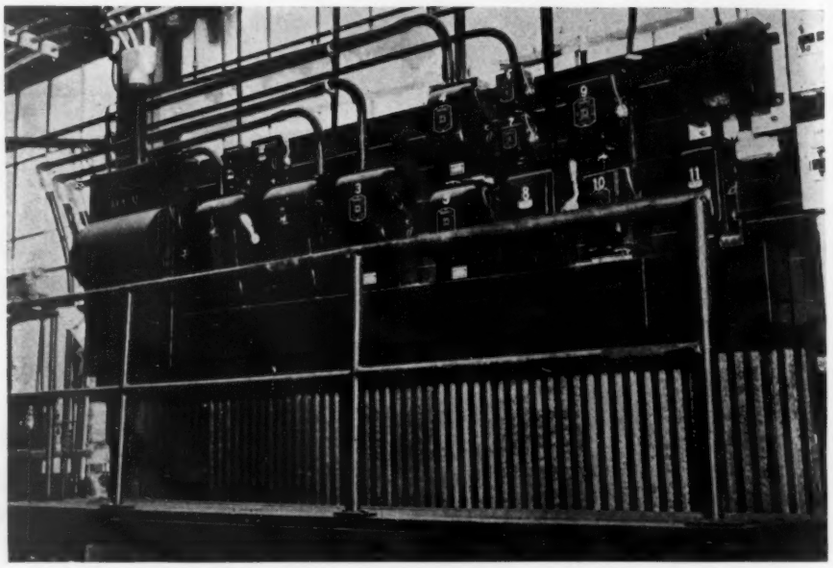
Simplex-ANHYDREX
deproteinized rubber insulation for wires and cables

A test on a 12-in. length of the tube showed a drop of 4 millivolts at 2,000 amp. in the conductor, with only 3½ millivolts drop in the joint.

•

Modern Power Layout for Drop Forge Shop

Overheated switches, blown fuses, contact trouble, excessive voltage drop and a host of similar difficulties common to overtaxed electrical systems impelled Interstate Drop Forge Company, Milwaukee, to undertake a revision of the electrical system serving one of their forge shops recently. Two features of the resulting system are worthy of note as typical of practice contributing to growing



Centralized controls on elevated platform to stop mechanical damage, minimize vibration difficulties and free floor space

Metal-inclosed bus atop new heavy-duty service switches cuts feeder losses—stops heating

trends in industrial electrical engineering. They concern the use of a metal-enclosed "stub bus" ahead of new extra heavy service switches and the centralization of switching equipment and controls above the forge shop floor.

When two new 1,200-amp. service switches were installed to replace inadequate old equipment steps were taken to keep voltage drop ahead of the switches to a minimum. The switches were installed as close as possible to the plant substation. New feeder cable (four 500,000-circ.mil per phase) was brought in from the main 450-kva., three phase, 3,810/240-volt transformer to the switch location and a 2,000-amp. capacity stub bus consisting of two straps per phase was run in a metal housing across the top of the switches. While the resulting installation shown was slightly more costly than run-of-mine installation, the compactness, effectiveness and appearance of the job appear to justify it.

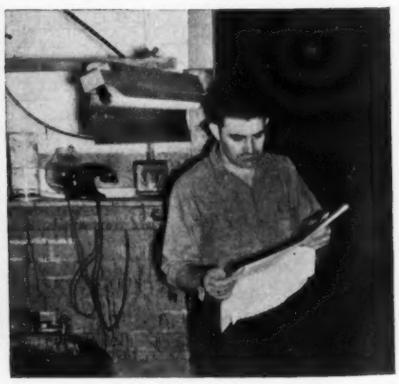
One of the two new service switches is used to supply existing feeders, while the second serves a new 750,000-circ.mil three-phase feeder installed to relieve the overloaded condition of the existing feeders and provide for load added in a new section of the shop.

In regrouping the machines and dividing load between the two principal feeders, switching equipment and electrical controls for circuits and individual machines were centralized on a platform above the floor. This step freed equipment from the mechanical damage by trucks and materials on the shop floor and from the considerable vibration of the heavy drop hammers, which had been a source of considerable trouble previously. Only the necessary pushbuttons were retained on the machines.

The platform upon which the controls are located is 12 ft. above the shop floor. It is 15 ft. long, 3 ft. wide and is provided with an iron railing for the convenience and safety of workers.

Match Wall Paper Colors Under Fluorescent Light

Standard wall paper samples are compared for color quality with production-run paper under "daylight" from a 20-watt fluorescent lamp mounted in an adjustable wall bracket at the Crystal Lake, Illinois, plant of the Statter Wall Paper Company. The two samples are mounted and lapped on a "joining board" exactly as on a wall. For



quick color checks in the plant before and periodically during production runs another 20-watt fluorescent lamp (right) is provided in the paint room. Both lamps are in Curtis X-Raylet No. 6 fixtures. The lamps are used principally during night production and on cloudy days.

Now a

FLUORESCENT LIGHTING UNIT

Made to RLM Specifications

ANNOUNCING A NEW RLM SPECIFICATION FOR A 48″ FLUORESCENT TWIN LAMP UNIT

As a result of engineering studies and laboratory tests, carried on during the last few months, the RLM STANDARDS INSTITUTE announces the establishment of RLM Specifications for a new type of Fluorescent Lighting Unit especially designed for general illumination of Industrial and Commercial locations.

This unit makes available a new type of lighting. With the conventional 10 foot spacing and mounting heights, 20 foot-candles of daylight quality illumination are evenly and uniformly distributed over the working surfaces. Shadows are soft and luminous and there is no annoyance from glare or heat.

Salient points of these new units made in accordance with the new RLM Specifications are:

A. *Porcelain Enamel Reflecting Surface for diffusion and durability.* Time has proven the durability, sustained efficiency and low maintenance cost of porcelain enamel. It is not affected by heat, cold or atmospheric conditions. It is easily cleaned.

B. *78% Light Output Efficiency.* The design of the reflector, spacing of the lamps and high efficiency of the porcelain enamel reflecting surface combine to produce an unusual high light output efficiency.

C. *17½ Degree Cut-off.* An RLM cut-off standard for over 20 years and now generally accepted as good lighting practice. Insures adequate shielding of the light source to minimize glare. In addition the ends of the unit are closed to further protect the eye.

D. *Uses two 48″ Mazda Fluorescent Lamps.* Approximately 100 watts used by lamp and auxiliary.

E. *New Type Auxiliary Corrects Power Factor and Flicker.* These auxiliaries are also equipped with removable and renewable starting switches located in the socket.

F. *Equipped with Auxiliaries Approved by the Underwriters' Laboratories.* All auxiliaries used in RLM units carry the approval of the Underwriters' Laboratories.

As with all RLM Lighting Units, the RLM Label affixed to a Fluorescent Lighting Unit is a warranty of conformance to RLM Specifications and is so attested to by the Electrical Testing Laboratories. This new RLM standard Fluorescent Unit will be available from manufacturers of RLM Lighting Equipment after December 15, 1939. New Specifications have been published giving complete information about this new unit. Ask your supplier of RLM reflectors or write Institute for a copy.

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

20 N. WACKER DRIVE • ROOM 1130 • CHICAGO, ILL.

THE CERTIFICATE OF RLM UNIFORM QUALITY

NEW ENGINEERING IDEAS

Guy Lead Problems Solved Graphically

By STUART D. LONG
Civil Engineer, Grand Rapids, Mich.

The accompanying chart has been prepared to give a quick and accurate solution to problems of guy leads and embodies a feature which takes into account various combinations of conductors and safety factors. It has been drawn for Nos. 0, 2 and 4 A.C.S.R. strands that develop a final tension 60 per cent of their respective ultimate strengths when subjected to a loading of ½-in. of radial ice and an 8-lb. wind.

The left-hand part of the chart was developed by plotting the various resultants to corresponding deflection angles for single conductors, using the equation $R = 2\,T \sin A/2$, where T is the tension equal to 60 per cent of the ultimate strength and A is the deflection angle. No account was taken of the fact that large deflection angles tend to increase when acted upon by a quartering wind. That is to say, when a wind blows against the conductors in line with their resultant, a deflection angle of 60 deg. will be increased to around 70 or 75 deg. due to the horizontal displacement of the conductors. This fact was neglected, for with a quartering wind the conductors will not be likely to develop 60 per cent of their ultimate strength.

The remainder of the chart was constructed by laying off the left and right vertical scales. The central vertical scale was picked at random and placed about midway between the left and right scales. The points for wire numbers and factors of safety were found by drawing intersecting lines from any of the points on the left and right vertical scales to corresponding values on the central scale.

Dead-end strains for the three conductor sizes have been placed on the left scale for single conductors and their guy leads are determined in the same manner as split-angle guys.

The chart also lends itself readily to determining the factors of safety of existing guys. In this case the chart is run through from the left to the central scale and the point marked. Then following the chart backward from the lead-to-height

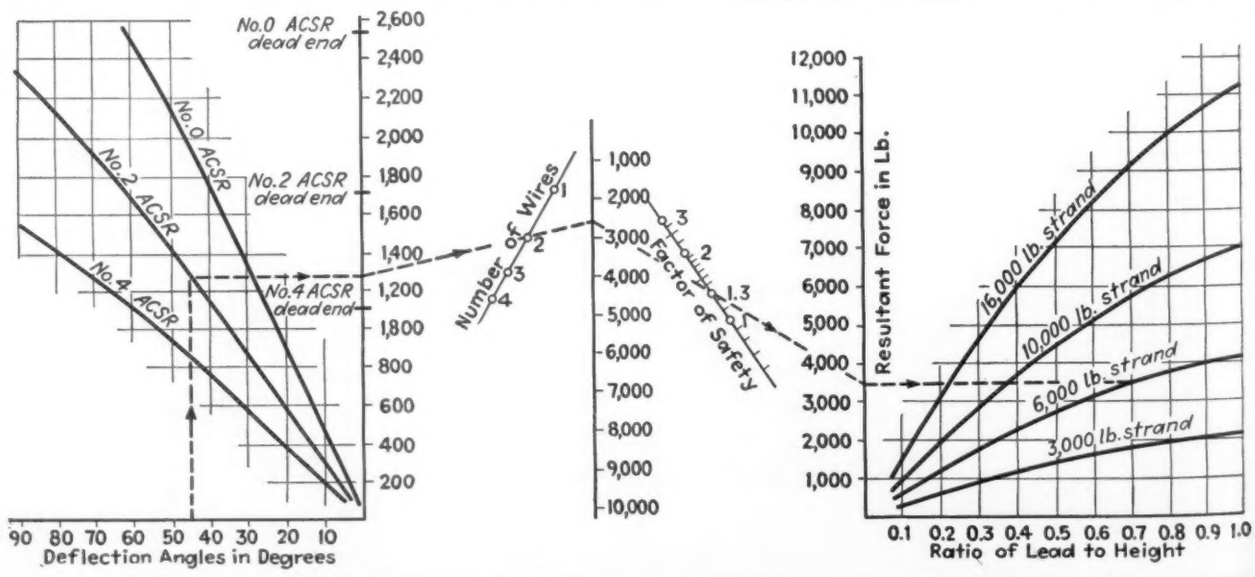


Chart aids in the determination of split-angle and dead-end guy leads
The example indicated on the chart is for a two-wire split-angle guy lead of No. 2 A.C.S.R. with a deflection angle of 45 deg. and a safety factor of 1.3. It is found that a 16,000-lb. strand can be used with a lead-to-height ratio of 0.22, a 10,000-lb. strand with a ratio of 0.37, or a 6,000-lb. strand at a ratio of 0.7.

G-E CONDUIT

IS MADE OF

"RIMMED STEEL"

SEAMS DON'T SPLIT EVEN ON SEVERE BENDS

"Rimmed Steel" is used for G-E conduit because it permits the best possible weld. It is an open hearth product that "rims" when cooling—that is, the purest steel gathers at the edges of the ingot. This outside layer of "purest steel" is retained during all subsequent treatments of the steel. Therefore, when the "skelp" is tubed the purest steel at both edges of the "skelp" join in the weld.

"Rimmed Steel" practically eliminates split seams even on severe bends. It is uniform, bends easily and threads cleanly.

G-E White Rigid Conduit, made of "rimmed steel" is hot-dipped galvanized and Glyptal coated inside and out. G-E Black Rigid Conduit, also made of "rimmed steel" is treated with a protective coating of tough black enamel inside and out.

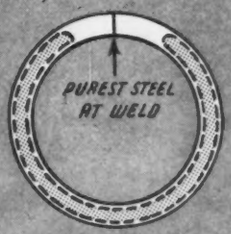
For further information about G-E Conduit, see the nearest G-E Merchandise Distributor or write to Section C-91111, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

FIGURE 1
Cross section of steel ingot to be used for G-E Rigid Conduit showing "rimmed" formation. (Purest steel collects at sides when ingot is cooling.)

FIGURE 2

Cross section of steel strip of skelp with original "rimmed" steel formation retained. (Note purest steel at sides which will join when tubed.)

FIGURE 3
Cross section of G-E Conduit, butt-welded. (Notice "rimmed" formation is still retained when tubing is formed and permits best weld.)



GENERAL ELECTRIC

ratio, a point will be found on the "resultant" scale. The line joining these two points will cross the factor of safety line at the existing factor of safety.

•

Cadmium-Nickel Storage Battery

Although the cadmium-nickel battery is not used in America, it has been widely used in Europe because it is applicable to severe service conditions and wide temperature fluctuations have but little effect on it. In a paper presented before the Electrochemical Society by Anna P. Hauel a general description of the positive tube electrode and the pocket type electrode was given.

The positive tube electrode is very complicated and requires expensive machinery. Alternate layers of nickel oxide and metallic nickel flakes, the latter serving as a conductor, are introduced into the tubes under pressure. The tubes are very rigid and their walls do not respond to the pressure developed in the nickel oxide during the first charging and discharging of the battery.

Pressure-Responsive Electrode

The pocket type electrode is so constructed that it will respond to the pressure generated in the active material. The pocket strips are folded and joined into one another so that as the pressure increases the strips push apart as the active mass swells, and the whole plate thereby becomes uniformly thicker. These strips are made of perforated sheets of nickel-plated steel, annealed in hydrogen so that the nickel plating is impervious. The active material of the positive plates is nickel hydroxide plus pure crystalline graphite (metallic flakes may be used in place of the graphite). The active material of the negative plates is cadmium oxide or hydroxide.

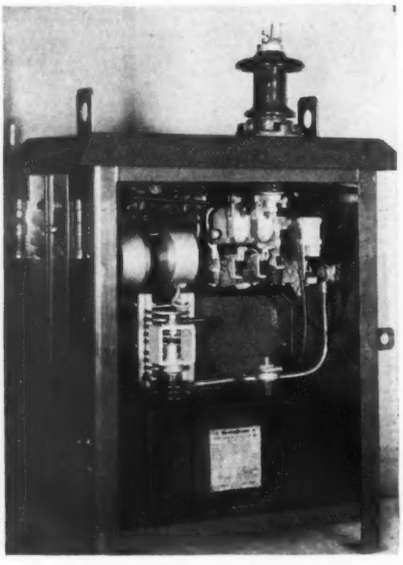
In European countries these batteries have found extensive use in train lighting, because of their wide temperature range; for traction purposes, because under severe conditions the active material does not shed; as mine lamp batteries, radio batteries, military and emergency purposes, because of their low discharge factor, and as a starting battery because of the low internal resistance.

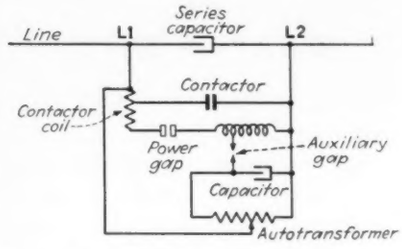
Series Capacitor Protector Control

By R. E. MARBURY
Capacitor Engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

With the development of a protective device to limit the possible overvoltage under short-circuit conditions to double the normal value series capacitors are no more expensive to use than shunt capacitors, except for any increased cost that may be necessitated by insulating the units themselves from the ground, depending on line-to-ground voltage in the particular case.

In the series application the capacitor cancels the reactance of the circuit to correct the power factor of the line and reduces the instantaneous voltage drop responsible for lamp flicker. During periods of heavy short circuit, however, the voltage across a series capacitor may rise to values sufficient to damage the capacitor unless it is given extra insulation or unless some means is adopted to shield the capacitor from these potentials.





Protector control limits overvoltage on series capacitor during line short circuit

A complete unit is shown at the left; the schematic diagram (right) indicates the component parts of the protective device.

With the device illustrated, the capacitor is by-passed during extreme overload. The voltage drop across the series capacitor L_1—L_2 induces a certain voltage across the small autotransformer, keeping a very small auxiliary capacitor charged to approximately 4,000 volts r.m.s. The auxiliary gap is set to break down at between 4,000 and 8,000 volts r.m.s.

If, during a short circuit on the line, the voltage should double across the series capacitor, the auxiliary gap will break down. The auxiliary capacitor then discharges into the small inductance, producing a high-frequency oscillating circuit. This raises the potential across the power gap due to a superimposed high-frequency voltage of about 10,000, causing sparks to bridge and ionize this gap, capable of carrying 5,000 amp. for five seconds.

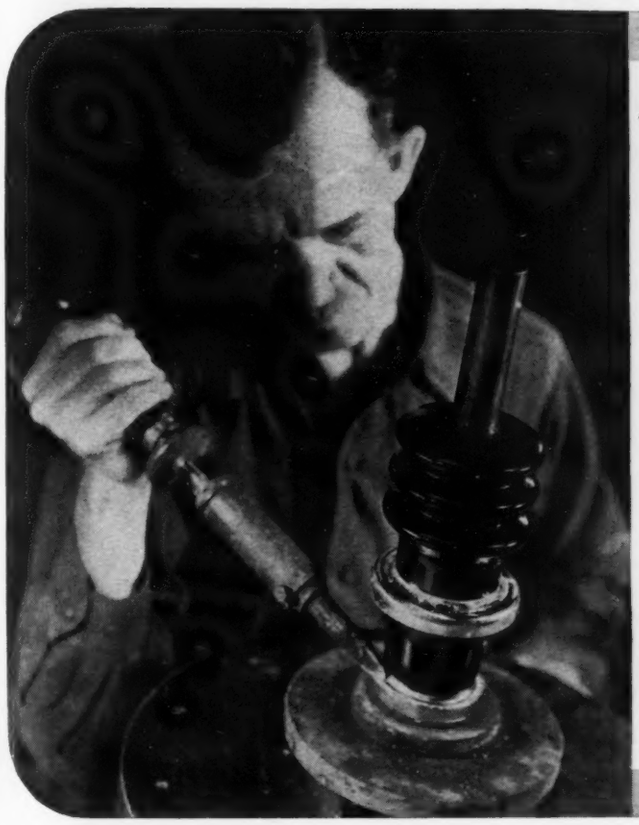
The power current which follows on ionization of the power gap passes through a contactor-closing coil which closes a contactor shunting both the series capacitor and the power gap, bringing down the voltage to about 40 volts, the arc drop across the gap. Closing of this contactor also takes out of use a portion of the contactor-closing coil, leaving only enough turns to keep the contactor sealed in at a current slightly in excess of the normal rated working current of the series capacitor.

When the short circuit has passed and the current through the series capacitor drops to normal, this contactor will drop out, restoring the series capacitor to service. The two protector control units available are for normal working currents of 50 and 100 amp.

This arrangement makes no provision for limiting the continuous operating current of the series capacitor. It is assumed that the rated working current will not be exceeded by more than 15 per cent in service, corresponding to the normal overvoltage which is allowed on shunt capacitors.

FOR THE FINEST PERFORMANCE

Westinghouse Porcelain



A hermetic seal between metal and porcelain is as simple as an ordinary soldered joint.

Progressive General Cable Corporation for years has been using Solder-Sealing—the only complete and permanent hermetic seal for electrical apparatus.

SOLDER SEALING IS NOW AVAILABLE TO ELECTRICAL APPARATUS MAKERS

Until Westinghouse perfected the original Solder-Sealing process, it was impossible to obtain an adequate and permanent porcelain insulation seal for oil-immersed apparatus. This development not only creates a hermetically tight joint between porcelain and metal but is relatively inexpensive, and it is effective under all operating conditions.

Today the buyer and user of oil-immersed apparatus can enjoy this same freedom from trouble—this same permanent protection—because Westinghouse now makes this modern development available to all manufacturers of electrical apparatus. When you next order apparatus—specify Westinghouse porcelain. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-05072

Westinghouse Porcelain

LOAD BUILDING

Promote Infra-Red With Trial Lamp Bank

Commonwealth Edison Company has assembled a bank of the popular infra-red heat lamps which it is loaning, without charge, to interested industrial customers for experimentation and test purposes. Application of the infra-red lamps in industry for drying and other operations is encompassed by difficulties because there is no rule-of-thumb method that will assure the best and most efficient use of the lamps.

By making a bank of the lamps available for experimentation, the company is giving customers an opportunity to determine for themselves the aptitudes and limitations of the new light-heat source to their production problems, without expense. It is believed that this course will contribute to wider, more effective and, on the whole, more satisfactory application of the lamps.

The demonstration unit, built in the company's testing laboratory, consists of eight special reflectors mounted rim to rim on a simple strap steel frame. Each reflector is equipped with a 260-watt infra-red lamp. Shown here in operation in a customer's plant, the unit has not been in operation a sufficient length of time to permit any conclusions to be drawn as to its value as a promotional tool in terms of load and revenue.

•

Sells Better Light Across the Tracks

Having convinced themselves that "few homes today are too humble to use good light," West Texas Utilities Company last year put this axiom to test when it carried a better light-better sight campaign into homes "across the tracks" as well as along "silk stocking row." The campaign featured a 150-watt adapter type drop cord lighting fixture and lasted for 45 days. In that time the company, serving the central portion of far-west Texas, where there is less than one residential customer per square mile, sold 7,096 of these fixtures.

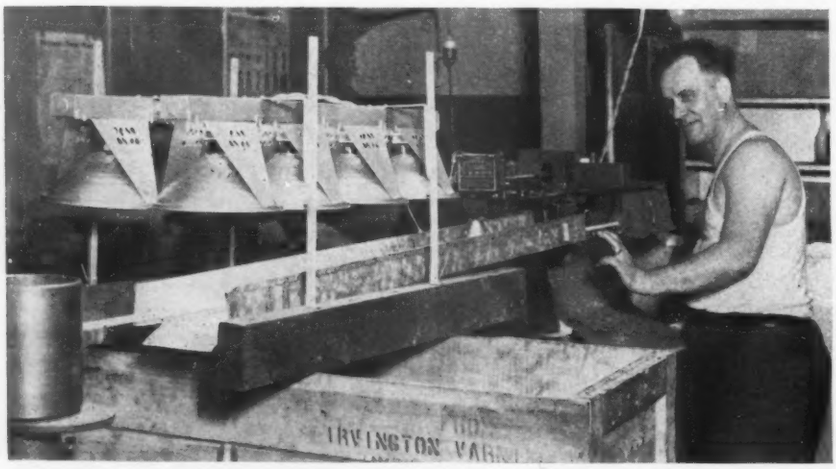
This $1.25 adapter unit, which fits any drop cord socket and gives indirect light, won quick favor in both types of homes, where it frequently replaced 40-, 50- or 60-watt lamps.

Sales didn't stop with the end of the campaign. During the 30 days following 1,246 adapters were sold on the campaign's momentum alone without a single home demonstration.

Initial low-cost and vastly improved lighting at little additional per-customer cost has made the adapter lamp and the Pin-it-Up lamp popular with the low-use customer in Texas, at the same time building additional load and revenue for the company. Last year's Pin-it-Up lamp campaign sold 5,995 100-watt units priced at $1.95. Both these fixtures are being campaigned again this fall as a means of reaching the low-use customer.

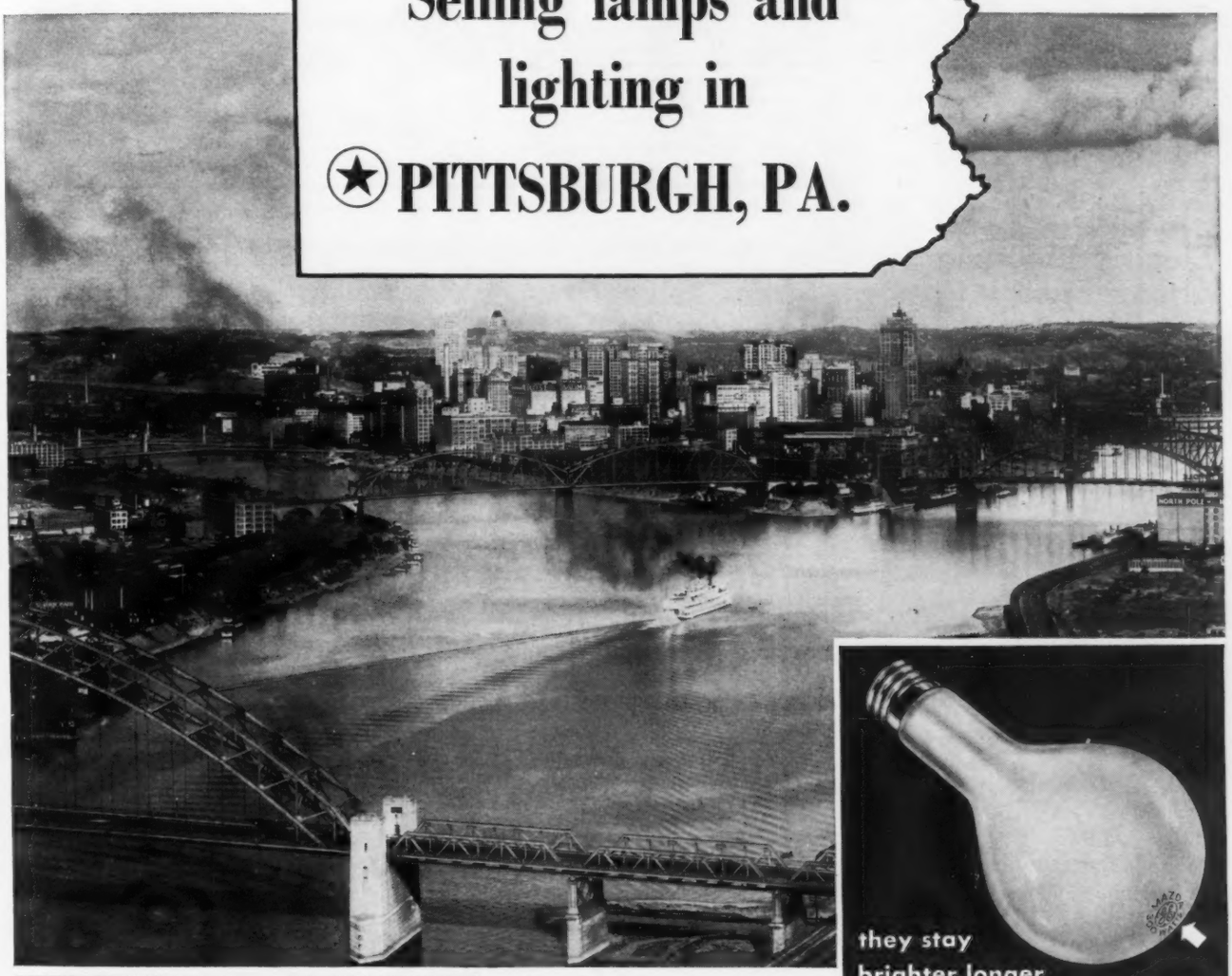
All lighting activities are conducted by the lighting department. Efforts of the company to induce employees, outside the lighting department, to sell lamps or fixtures have been only moderately successful. The lighting department consists of one lighting director, three lighting supervisors and 20 advisers (demonstrator salesmen), paid on a salary plus commission basis.

Although no intensive campaign on three-way floor lamps was conducted by the West Texas Utilities Company last year, 1,760 of the 100-, 200-, 300-watt lamps were sold. This brought the total of units in homes served by the company to



Commonwealth Edison promotes use of infra-red lamps with free test installation

Selling lamps and lighting in ★ PITTSBURGH, PA.



View of Pittsburgh, population 831,927

AND FOR ANY CITY . . . Your own for instance, you can easily estimate the approximate number of lamp and lighting advertisements General Electric is delivering to your customers by applying the following national averages:

Going into the average wired home in 1939

14 magazines with G-E lamp ads
5 newspapers with G-E lamp ads
5 radio messages
24 total advertising messages

• • •

In the last 10 years, the average wired home received

158 magazines with G-E lamp ads
30 newspapers with G-E lamp ads
20 radio messages
208 total advertising messages

HERE'S a composite view of the way that General Electric is constantly at work in greater Pittsburgh, promoting light-conditioning for Better Light-Better Sight. Into Pittsburgh homes every week goes a steady stream of G-E lamp and lighting advertisements amounting to more than 44 impressions per person in the last ten years.

IN 1939 . . . . . 2,220,000 magazines with G-E lamp advertisements and 1,000,000 radio messages.

SINCE 1929 . . . . 23,310,000 magazines with G-E lamp advertisements.

FALL 1938 . . . . . 2,925,500 copies of Pittsburgh newspapers with G-E lamp advertisements.

LAST 3 YEARS . . 9,737,500 newspapers with G-E lamp advertisements.

SINCE 1929 . . . . 37,047,560 advertisements in magazines, newspapers, and radio . . . which is approximately 44 advertisements per capita.

G-E MAZDA LAMPS
GENERAL ELECTRIC

about 10,000, or slightly better than 25 per cent saturation. Sales of study lamps were low, amounting to 478. Salesmen complained of the "top-heavy," "unsightly" physical makeup of the table model, which, they said, was "accepted for quality, but never for beauty." A smaller lamp for study purposes was recommended, marked by more graceful lines and giving equally good light.

•

Electric Brooding at Low Energy Cost

By RALPH J. BUGBEE
Agricultural Engineer Central Vermont Public Service Corporation, Rutland

To demonstrate that electric brooding of chicks can be done economically in cold weather at an average cost which farmers can afford, two projects were analyzed recently with the help of the vocational agricultural department of the Brandon High School and the Vermont School of Agriculture at Randolph Center, with the result that the cost per chick for electricity in the former was 3.89 cents at the former place and 2.55 cents in the latter, with conditions varying as shown in the accompanying table. Including grain cost, the expense per chick was 14.42 cents at Brandon and 11.32 cents at Randolph, the periods of brooding being respectively January 27 to March 10 and January 12 to February 23.

Cost of Electric Brooding in Vermont

Period Six Weeks	Brandon	Randolph Center
Brooder used	67-in. Lyon with fan	56-in. Lyon with fan
Chicks started, number	255	265
Mortality	10	34
Outside temperature range	—7 deg. to + 41 deg. F.	—22 deg. to +42 deg. F.
Inside floor temperature range	+19 deg. to +54 deg. F	—11 deg. to +52 deg. F.
Brooding dates	Jan. 27-March 10	Jan. 12-Feb. 23
Kilowatt-hours used	473	295
Money cost of electrical energy	$9.46	$5.90
Cost per chick for electricity	$0.0389	$0.0255
Grain per chick	4.444 lb.	3.376 lb.
Grain cost per chick	10.53 cents	8.776 cents
Cost for grain and electricity per chick	14.42 cents	11.32 cents
Weight per chick	1.5 lb.	1.07 lb.

At Brandon the test was conducted by Chester Watters, who appeared to have the coldest place in which to house the brooder. The building was a single board and clapboard covered garage with rolling double doors facing north and having a cement floor. Three windows with east, south and west exposures provided natural light. The only change made to install the brooder was a width of celotex building board with a tight door across the north end to cut down the floor draft around the loose-fitting rolling doors. West winds direct from Lake Champlain hit the building.

The Hubbard Farms, Walpole, N. H., donated 255 cockerel chicks which arrived on January 27 with an outside temperature of slightly below zero. A new Lyon 67-in. brooder with ventilating fan was used and two 3-gal. vacuum type water fountains were warmed by Trumbull automatic water heaters. Peat moss was used for litter over a layer of newspapers directly under the brooder area. A wire guard covered with grain sacks, 18 in. from the hover edge, completed the equipment except for small feeders placed radially, with two-thirds of their length under the hover. Some feed was also placed on newspapers both under and outside the hover. On the first day seven chicks were caught outside on a sloping newspaper and could not climb back to the heat, becoming chilled beyond hope before being found. During the following six weeks brooding period only three more chicks died from all causes, although the outside temperature varied from — 19 to + 41 and the inside temperature at floor level from + 19 to + 54.

In the Randolph project a 56-in. Lyon brooder was used. This was installed in a 10 x 12-ft. standard brooder house on the school campus in one of the highest villages of the state. Clayton Moore, a student from Fairhaven, Vt., who had never before operated a brooder, was in charge. Hall Brothers, Wallingford, Vt., donated 265 mixed red chicks. In the first three or four days, due to absence of experienced supervision to insure putting feed under the hover at the start, some 30 chicks were lost, but after that there was virtually no loss despite an outside temperature range of —22 to + 42 deg. F. and a range at the hover edge of — 11 to + 52 deg.

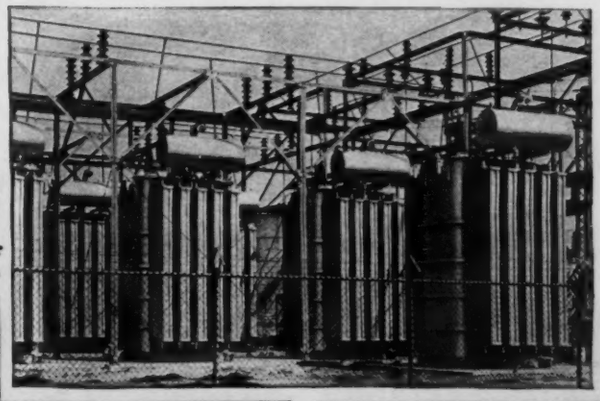
It was concluded from these tests that it is not necessary to have a specially constructed building for electric brooding; that feed must be provided under the hover for first few days; that overcrowding cuts down the energy consumption, but also slows down the rate of growth; that the operating cost in extreme weather is no more than with coal or oil, and that the labor element and fire hazard are reduced to a minimum.

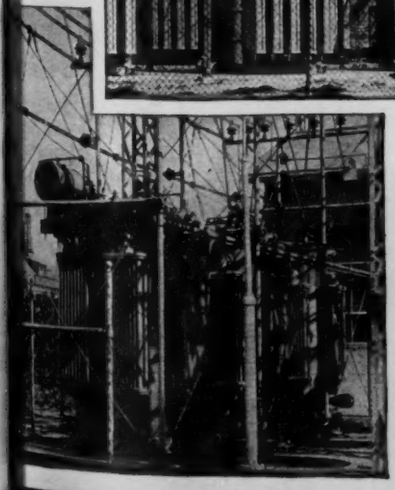
DETROIT EDISON USES 75 ft.-candles in sales assembly room—"It Takes Time to See," says the Detroit Edison Company. So this sales assembly room in the company's service building has been provided with 75 ft.-candles. The lighting is economically and pleasingly secured by In-Bilt Controlens equipment; 10 watts per square foot of floor area is provided.

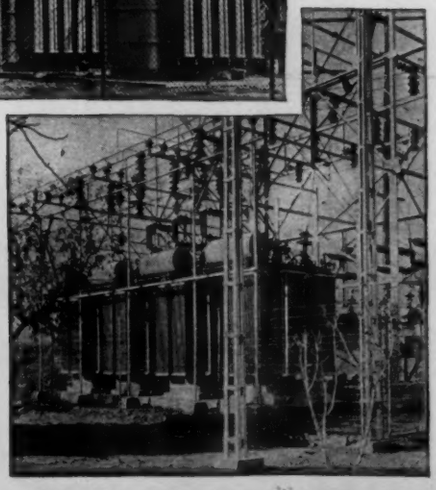
WAGNER Power Transformers Promote Service Continuity

For nearly 50 years Wagner power transformers have been responsible servants assisting in the unfailing transmission of electric power. Wagner power transformers have maximum efficiency and are completely dependable because: (1) they are liberally designed with extra factors of safety, (2) materials and parts are carefully selected and pre-tested, (3) modern production methods are utilized in their construction, (4) the very latest developments are embodied in their design, (5) only carefully trained workmen are used for their manufacture, and (6) all completed transformers are subjected to rigid and comprehensive engineering and commercial tests before shipment to customers. Utility companies will find it to their advantage to give Wagner an opportunity to quote on their next power transformer installation.

One of the 16,000 KVA, single-phase, water-cooled power transformers installed at a large power and navigation dam.







...w typical ...allations of ...er power ...formers.

WAGNER Offers Complete Transformer Service

In addition to power transformers, Wagner also makes a complete line of distribution transformers, including stud-bushing type; primary-pocket-stud type; sub-station and sub-way types, single, or three phase; rural-line; and air-cooled transformers.

No matter what your requirements are, Wagner transformers will do the job. Our trained sales-engineers, located in twenty-five principal cities, will be glad to help you on any transformer problem. Write for free bulletins 180 (Distribution) and 181 (Power).

T39-10

Wagner Electric Corporation

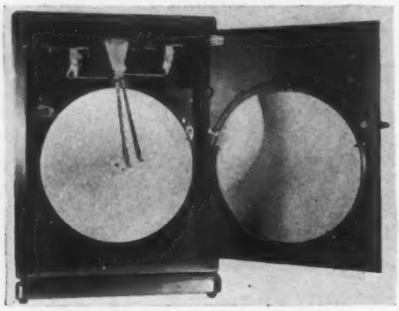
6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

RANSFORMERS • MOTORS • FANS • BRAKES

NEW EQUIPMENT

Demand Meter

To provide an instrument to determine accurately power and reactive power for the determination of power factor and kva. at maximum demand this company



"Two-pen" 12-in. round chart demand meter, total weight 18 lb.; charts 12 in. diameter, 4¾ effective; scale, 100 division marked 0-1.5 kw.; chart drive Telechron motor, 2-8-16-32 days per rev. **Therm-Electric Meters Co., Inc.,** Ithaca, N. Y.

has developed a two-pen 12-in. round chart graphic recording demand meter. The two pens are operated from separate two-element actuating arms. These elements are arranged to measure the two quantities, power (watts) and reactive power (RVA), and as both these quantities are recorded on a single chart driven by a common mechanism it is claimed no time error in the time of occurrence of the two quantities is possible. Furnished with external phasing transformer having three sets of power factor taps and one set of RVA taps.

•

Wiring System

"Plug-in-anywhere" multi-outlet wiring system for small home and apartment use. **Wiremold Co.,** Hartford, Conn.

Smaller in size and designed to fit above the standard baseboard, this system comes with a complete line of fittings and receptacles.

•

Fluorescent Fixture

"Stream-Liter" twin-lamp fluorescent fixture for the new 48-in., 40-watt lamps. **Benjamin Electric Mfg. Co.,** Des Plaines, Ill.

Twin-lamp fixtures utilize a single reflector common to both lamps. Lamps, sockets, thermal glow-switch type starters and line ballast equipment for regulating current to the lamps are all attached to the reflector, which is hinged to the upper housing of the fixture. The company claims that by spacing this unit approximately on 10x10-ft. centers and mounting to 10 ft. from the floor a uniform illumination over the working area of 20 ft.-candles or more is secured.

•

Circuit Tester

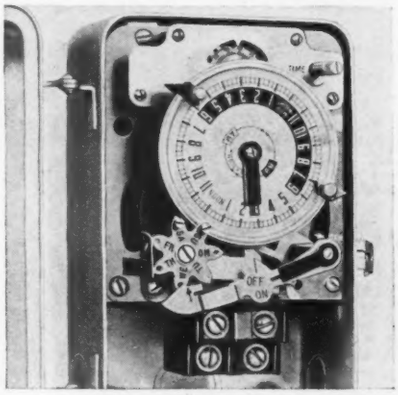
"Saftest" circuit tester and polarity indicator for electrical circuits from 80 volts to 550 volts, a.c. and d.c. **M. M. Fleron & Son, Inc.,** Trenton, N. J.

The feature of this tester is the neon indicator bulb inclosed in a new transparent molded plastic housing. The test lead tips are insulated and the indicator bulb is protected against higher voltages with a special resistor.

•

Time Switch

Applications of this new time switch include store- and show-window lighting, electric signs, alarms, signal systems, etc. The advantages of this device, the company claims, are that it is smaller and lighter and has an astronomic dial for turning circuits "on" and "off" at dusk and dawn.

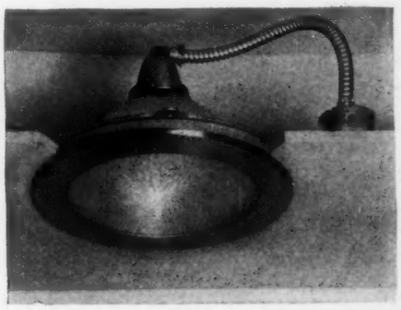


"Type T-44" indoor-outdoor automatic time switch makes and breaks 35 amp., Mazda, inductive or resistance loads. **General Electric Co.,** Schenectady, N. Y.

BUYING ELECTRICAL EQUIPMENT? — "Electrical World" *Electrical Buyers Reference* is a convenient place to look first for names, addresses and products of manufacturers.

Built-In Lighting

Built with no metal housing, but of glass, the light surfaces are claimed to suffer no permanent depreciation. Mechanical construction allows easy cleaning. Effective



In-built, no-box controlens, unit No. 1894, 200-300 watts. **Holophane Co., Inc.,** New York, N. Y.

"down-light" without glare; light in glare zone (60 to 90 deg.) is salvaged and redirected usefully, the company claims. Light is transmitted without the aid of obtrusive fins, louvers, control rings, or other such devices. Finds commercial and architectural applications.

•

D.C. Motor

Explosion-proof d.c. motors as large as 75 hp. **Reliance Electric & Engineering Co.,** Cleveland, Ohio.

These motors are designed to operate safely in places made dangerous by the presence of gases and vapors. They claim that if dust or gas inside the motor inclosure should become ignited the resulting flame is prevented from escaping to the outside air and that the joints and motor construction will stand the pressure formed so that the surrounding vapors will not ignite.

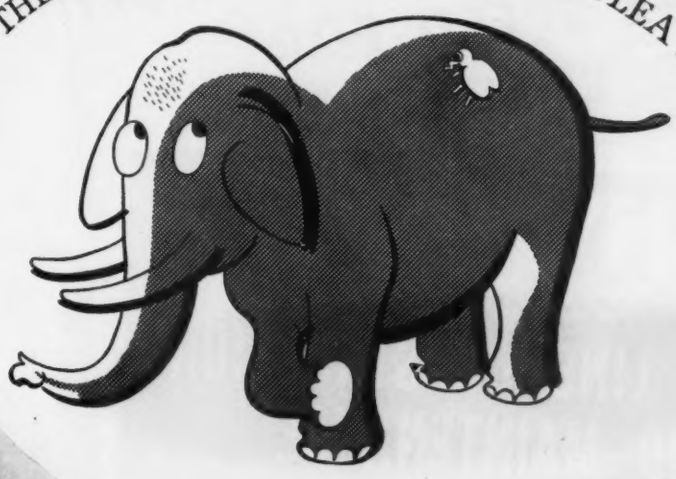
•

Mercury Switch

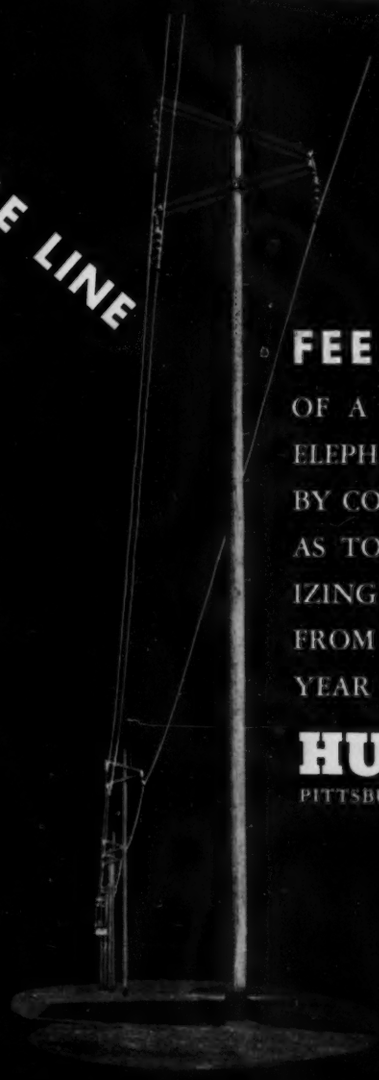
Metal mercury switch; 40 to 200 amp. **Durakool, Inc.,** Elkhart, Ind.

This company claims that its two reducing agents prevent deterioration of the mercury, increase the efficiency and reliability in operation and assure a long, uninterrupted life of the switch. Because, it is said, these switches can withstand tempory short circuits and will operate on a small tilt they can be used for many applications, ranging from wall switching

"THE ELEPHANT DOESN'T FEEL A FLEA BITE"



—NOR DOES A POLE LINE



FEEL THE BITE

OF A SINGLE DAY'S EXPOSURE. BUT IF THE ELEPHANT WERE TO WITHSTAND AN ATTACK BY COUNTLESS INSECTS HE WOULD NEED A HIDE AS TOUGH AS HUBBARD, DOUBLE-DIP GALVANIZING WHICH PROTECTS HUBBARD HARDWARE FROM THE CORROSIVE BITE OF THE ELEMENTS YEAR AFTER YEAR.

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

LOWER COSTS
Increase WORKMEN'S SAFETY
INSURE SPEED FOR
EMERGENCIES

HIGHWAY
Mechanized
POWER LINE CONSTRUCTION
AND MAINTENANCE
EQUIPMENT

HIGHWAY EARTH
BORING MACHINE

Digs in clay, hardpan, gumbo, shale, or frozen ground—digs anchor holes or holes at any required angle—great capacity—great flexibility—power and strength to operate with the largest of truck and tractor motors—light in weight—compact in construction—a wide variety of types and sizes.

HIGHWAY WINCHES—easier to use—smooth operation under heavy duty—a type for every need.

HIGHWAY POLE AND CABLE REEL TRAILERS. A wide line of pole trailer and combination pole and cable reel trailers to economically meet all needs.

HIGHWAY "CABLE SPLICER" TRAILERS. A splicer's workshop on wheels—weatherproof—thiefproof, and fireproof.

HIGHWAY ACCESSORIES. Drawbars, Towing Hooks, Automotive Pintle Hooks, Pay Out Reels, Collapsible Power Reels.

HIGHWAY BODIES. Ample roominess, comfort for crew, convenient in arrangement, lightweight yet rugged, save money over longest periods.

SEND FOR CATALOG

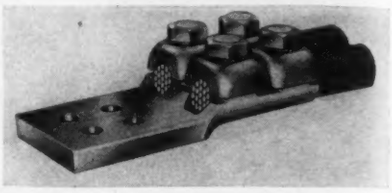
HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

to motor starting. May be used on electrical devices requiring from a few contacts a month to 2,400 a minute.

•

Electrical Terminal

Double clamping elements on each cable provide an extra factor of safety necessary



Electrical terminal "Q2AA," for joining two cables to a single terminal block. **Burndy Engineering Co., Inc.**, New York, N. Y.

in important installations, the company states. The body of the terminal may be silver plated to reduce contact resistance.

•

Tumbler Switches

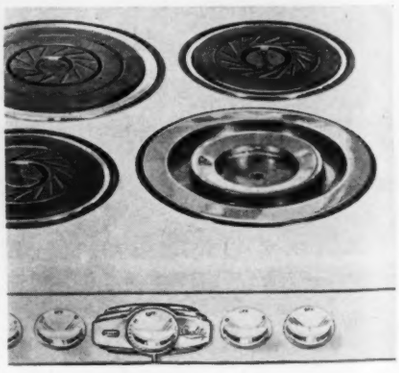
Tumbler switches with metal outlet box covers; boxes 3¼ x 4 in.; switch base 1 in. deep, 1½ in. long, ⅞ in. wide. **Arrow-Hart & Hegeman Electric Co.**, Hartford, Conn.

The metal switch frame is spot welded to the cover, claimed to make a permanent rigid assembly, easy to handle, wire and install. Switches come in both single-pole and three-way styles.

•

Electric Range Unit

The "Mystery Speedster" on this range is an induction unit of two parts. It is a transformer using the aluminum ring on the bottom of the utensil as a secondary



Electric range with "Mystery Speedster" unit and two special utensils. **Roberts & Mander Stove Co.**, Hatboro, Pa.

circuit; the primary coil is imbedded deep within the welded steel body in the range top. When the current is turned on the action taking place between the primary coil and the secondary circuit generates heat in the utensil. Only the special utensils provided with the range can be used on this unit.

•

Skip-Hoist Controllers

Heavy-duty skip-hoist controllers for squirrel-cage motors. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

The seven controllers in this line cover the range of skip-hoist duty, high or slow speed, balanced or unbalanced, single speed or two speed and arranged for non-automatic, semi-automatic or automatic opera-

We're Glad You're Big . .

We all like to do business with BIG buyers . . . that's only natural. For every BIG order we get . . . we get hundreds of small orders . . . we *have* to have them or else . . . it's the Combination that reduces costs to all Users.

If it weren't for the T & B Distributor, *we* just couldn't get around to dig up the small orders. Without those small orders, our manufacturing costs would go up . . . costs to the User would go up. Our Distributors uncover both the large and the small orders . . . they carry the stocks that regulate our production, they increase our volume and our operating efficiency.

Both the BIG BUYER and the small BUYER get all the extra services the T&B Distributor offers . . . without paying extra for them. They have ready access—night and day—to thousands of items from hundreds of Manufacturers. They have the use of the T&B Distributors' trained technicians, too . . . and can benefit from their knowledge of local problems.

All of which points to the T&B Distributor as an important economic factor in YOUR purchases of electrical fittings.

#6

A series of advertisements designed under the T&B Plan to set forth the economic reasons for the fixed T&B Distributor policy.

***The* T&B DISTRIBUTOR SERVES and SAVES**

The T & B Distributor . . .

REDUCES "HIDDEN COSTS"

He eliminates depreciation and obsolescence
He eliminates stock investments
He eliminates insurance and taxes
He saves on freight and cartage

HE SAVES YOU ADDITIONAL DOLLARS

There are fewer orders to write
Fewer shipments to handle
Fewer invoices to check
His Catalog and price information is up to date.

THE THOMAS & BETTS CO., Inc.

MAIN OFFICE and FACTORY ELIZABETH, N. J., U. S. A.

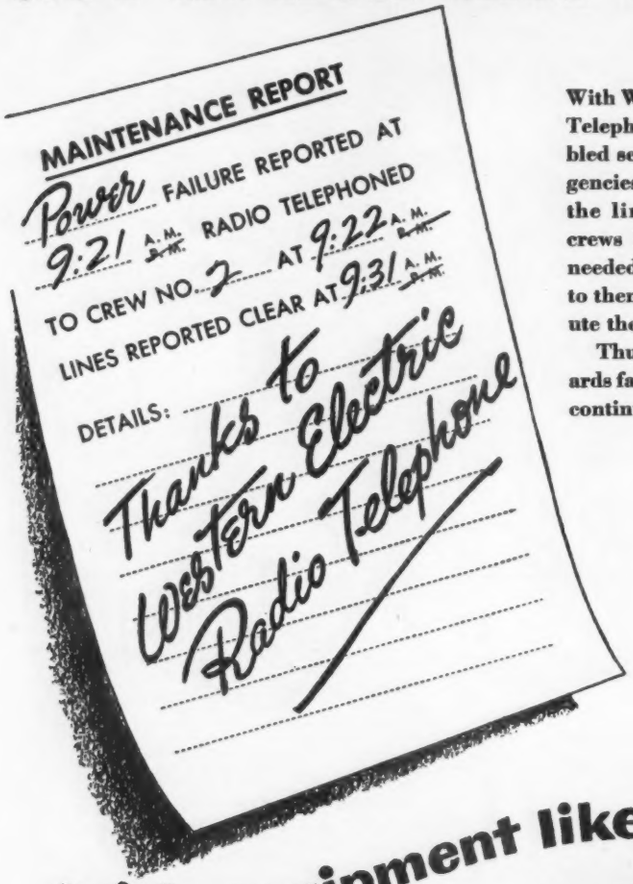
SALES OFFICES

Los Angeles • San Francisco • Denver • Atlanta • Chicago • New Orleans Boston • Detroit • Kansas City, Missouri • St. Louis • Elizabeth, New Jersey • New York City • Syracuse • Cleveland • Cincinnati • Philadelphia • Seattle • Dallas • Montreal • Toronto • Winnipeg • Vancouver, B. C.

EXPORT DEPARTMENT—BROOKLYN, NEW YORK

ELECTRICAL FITTINGS SPECIALISTS SINCE 1899

Get action like this—


MAINTENANCE REPORT
Power FAILURE REPORTED AT
9:21 A.M. P.M. RADIO TELEPHONED
TO CREW NO. 2 AT 9:22 A.M. P.M.
LINES REPORTED CLEAR AT 9:31 A.M. P.M.
DETAILS:
Thanks to Western Electric Radio Telephone

With Western Electric Radio Telephone, you restore disabled service *fast*... in emergencies, when storms strike the lines. You call repair crews immediately and get needed supplies under way to them. You know the minute the line is clear.

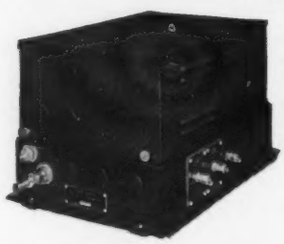
Thus you eliminate hazards faster... improve service continuity... build good-will.

with equipment like this...

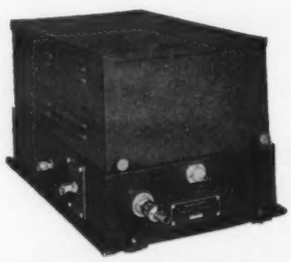
Whether you serve compact territory or long cross country lines, Western Electric has the right equipment to meet your needs. It's built for years of trouble-free service *under your conditions.*

Designed by Bell Telephone Laboratories, made by Bell telephone makers, it is backed by years of experience making radio equipment for airplanes, police, ships at sea, broadcasting stations.

For full details write Graybar Electric Co., Graybar Building, New York.



15 watt—100% modulated 28A mobile transmitter for fool-proof, reliable service.



28A superheterodyne crystal controlled receiver—offers clear reception even in poorest areas.

DISTRIBUTORS: *In U. S. A.* **Graybar Electric Co., New York.** *In Canada and Newfoundland:* **Northern Electric Co., Ltd.** *In other countries:* **International Standard Electric Corp.**

Distributed by Graybar Electric Company

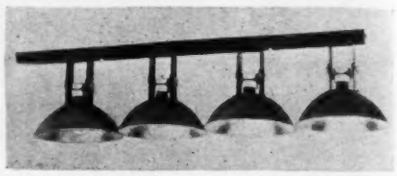
Western Electric
RADIO TELEPHONE EQUIPMENT

tion. Overload protection as supplied by a thermal overload relay is the inverse-time limit form. Low-voltage protection is provided.

•

Reflector

According to the manufacturer, these reflectors will accommodate all commercially available infra-red lamps by means of an



"Para-Sphere" reflector, for infra-red ray lamps, in single reflector units and in strips of four, five, six and seven reflectors. **Fostoria Pressed Steel Corp.**, Fostoria, Ohio.

easily adjustable porcelain socket. Thus, any such lamp can be brought to the proper focus for the heating or drying work at hand.

•

Anode Bag

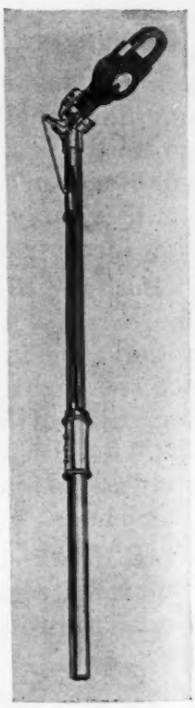
"Style D" anode bag, 5 in. wide. **Hanson-Van Winkle-Munning Co.**, Matawan, N. J.

These bags are impregnated top and bottom with a red resin. The company says that the resin tip prolongs the life of the bag; the resin coated bottom forms a pocket for the sludge; the resin stiffens the top of the bag, making it easier to fasten to the anodes.

•

Live Line Tool

The use of this instrument makes it possible to measure current distribution on high voltage with absolute safety and to reach out for conductors that are difficult to reach, the company states. The ammeter clamp is opened and closed by sliding the hand grip up and down the pole. The spruce pole is tested to withstand 75,000 volts per foot for five minutes, it is said.



"Tips Amertong," for use with the Weston "Model 633" clamp ammeter. **A. B. Chance Co.**, Centralia, Mo.

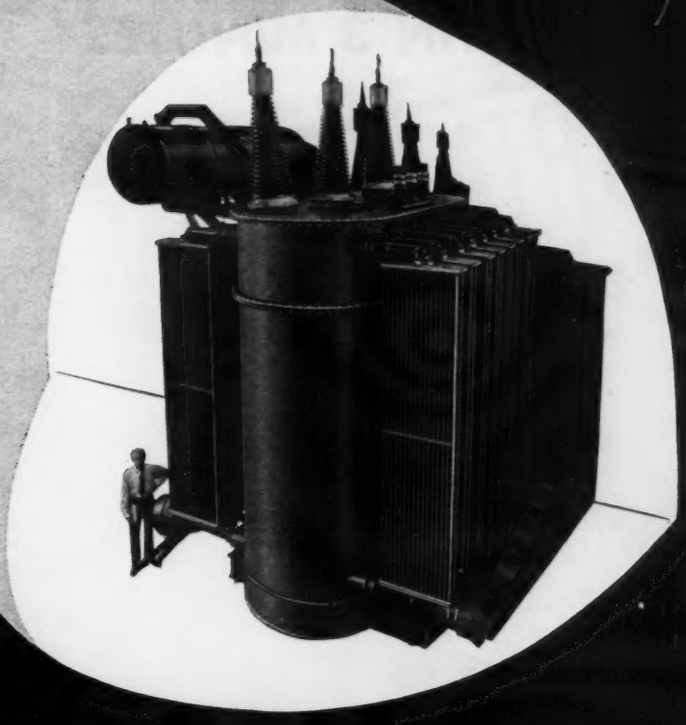
•

Oscillograph

Type 175 oscillograph for study of high- and low-frequency recurrent phenomena; type 175-A with control circuits added to the sawtooth oscillator; reading time variable from 15 to 30,000 times per second. **Allen B. DuMont Labs., Inc.**, Passaic, N. J.

This new instrument uses a type 54-11-T 5-inch intensifier-type cathode-ray tube. It is claimed that by its use lower deflection

In the Spotlight-



with its *PERFORMANCE!*

PERFORMANCE is the yardstick by which transformer quality is measured. Repeat orders show what satisfied users think of Moloney performance. Past performance is indicative of future performance where Moloney is concerned. The same policy which, in the past, has earned Moloney's enviable record, is still being rigidly maintained. It is this policy of liberal design, finest materials and unexcelled workmanship that assures Moloney performance.

Specify **MOLONEY** . . . *Get* **PERFORMANCE!**

MOLONEY **POWER** TRANSFORMERS

ST. LOUIS

Select your next V-belt drive
THE WORTHINGTON WAY
...IN 3 MINUTES

USE this new copyrighted Worthington Master Manual containing original engineering data not available from any other source.

EASY TO HANDLE

No complicated calculations . . . . . Just simple arithmetic
No difficult engineering . . . . . Just good common sense
No tricky figuring . . . . . Just plain A B C

SEND FOR YOUR COPY TODAY

MV9-38

WORTHINGTON PUMP AND MACHINERY CORPORATION
Harrison, New Jersey
Send me a copy of the Worthington Multi-V-Drive Master Engineering Manual, V-1400-E2.

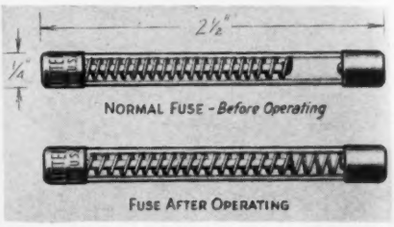
Name_____ Position_____
Firm_____
Address_____

voltage requirements from the amplifiers are necessary, while a lower voltage source for direct deflection may be applied when it is not desirable to employ the amplifiers of the instrument.

•

Sign Fuses

These fuses are connected across the sign by simple push-on clips. When the voltage becomes dangerous a small arc within the



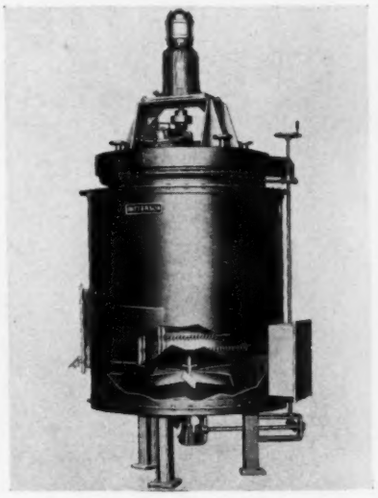
"Sign-Saver" fuses for neon signs. **Littelfuse Inc.**, Chicago, Ill.

fuse melts a fusible junction to release a shorting spring. In addition to preventing further damage to sign or transformer, the cut-out section instantly tells the maintenance man where the trouble is.

•

Electric Process Kettles

Featured in these new kettles are the "Flasheat" electric heating elements, which they claim give more rapid heat-up, more



Electric process kettles available in a wide range of sizes fitted with various types of mixing apparatus. **Patterson Foundry & Machine Co.**, East Liverpool, Ohio.

heat concentration per unit area, higher efficiency, unusual ruggedness, immunity from mechanical destruction and longer life. Replacements and repairs can be made without removing the insulating jacket from the kettle.

•

Lift-Truck

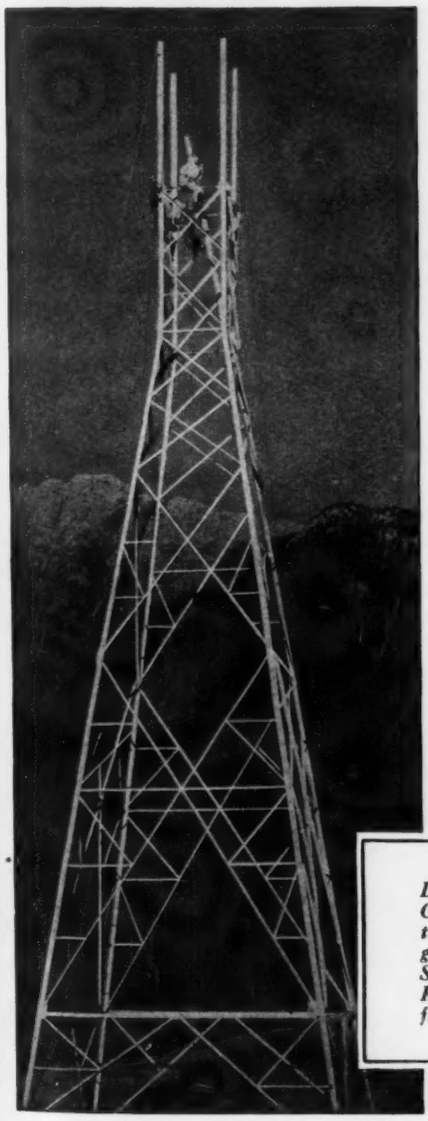
"Electric-propelled," lightweight, fork lift-truck to pick up, transport and stack 1,000- and 2,000-lb. capacity loads **Automatic Transportation Co.**, Chicago, Ill.

For use in receiving departments for loading and unloading box cars, motor trucks and trailers this truck is said to be maneuvered quickly in congested areas through a two-wheel castor-type controlled steer. Has telescopic and non-telescopic lift with "powerized" tilt feature backward and forward.

DESIGNED FOR *Dependable Service*

UNDER EXTREMES OF CLIMATE AND TERRAIN

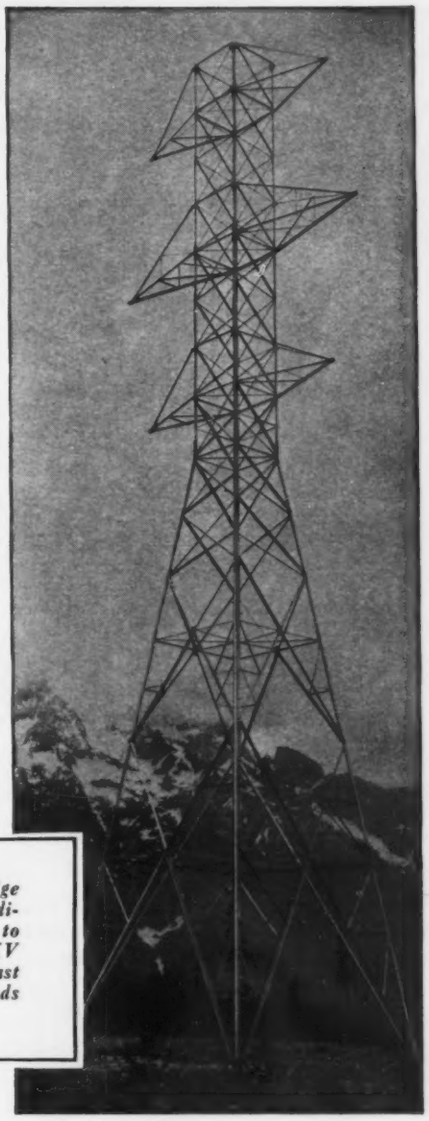
American Bridge Transmission Towers Skirt the Northwest Coast Range



TOWERS of today have to carry high voltages for long distances . . . must provide adequate clearances for the power cables. Their design must give careful consideration to the character and accessibility of the terrain . . . to economical and durable construction . . . to simplicity and speed in erection.

Planning towers to meet any problem of service, terrain and weather—towers to do specific jobs and do them well — has been the aim of American Bridge engineers since 1905. In the intervening years, they not only have kept pace with the ever-growing needs of electric power transmission, but have developed many patented features which contribute to more effective and economical construction of America's power net work.

The entire resources of American Bridge Company, which include an accumulated fund of highly useful experience, ample plant facilities, and up-to-date equipment for full-size tests, are at your service for any tower job.



***DESIGNED** and fabricated by American Bridge Company to fit pre-determined foundation conditions, these suspension type towers stand ready to give yeoman service on the double circuit, 240 KV Skagit Line No. 2. Skirting the Northwest Coast Range, this 116-mile electric power line extends from Newhalem, Wash., to Seattle.*

AMERICAN BRIDGE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit
Duluth · Minneapolis · New York · Philadelphia · St. Louis
Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

NEWS ABOUT PEOPLE

G. F. Stecker Completes Fifty Years of Service

George F. Stecker, general superintendent of construction of electric plants and substations for the Consumers Power Co., was honored recently at a company luncheon in Kalamazoo, Mich., on the completion of fifty

consecutive years of service. He was presented with a diamond service pin by Wendell L. Willkie, chairman of the board of the Consumers Power Co., and president of Commonwealth & Southern Corp.

Mr. Stecker's latest construction achievement is the new 70,000-kw. Bryce E. Morrow station on the Kalamazoo River at Comstock, Mich., dedicated immediately after the luncheon at which Mr. Stecker was honored.

Mr. Stecker became associated with the company in Albion in 1889, three years after its founding by the Michigan electrical pioneers, W. A. Foote and his brother, J. B. Foote. He supervised construction of numerous hydroelectric plants on the AuSable, the Manistee, the Muskegon, the Kalamazoo and other rivers and the construction of several steam-electric plants which form the backbone of the Consumers Power system.

•

▶ HARVEY C. COUCH, president of the Arkansas Power & Light Co., has been elected to the board of managers of the Lehigh Coal & Navigation Co. by the managers.

▶ AUBREY MCDANIEL, division manager of the Potomac Light & Power Co., Martinsburg, was recently elected president of the Public Utilities Association of West Virginia.

▶ F. J. LEERBURGER, formerly senior assistant engineer with Maurice R. Scharff, consulting engineer, New York, has been appointed principal valuation engineer for the New York Public Service Commission. Mr. Leerburger served as an engineer for the Duquesne Light Co., Pittsburgh, Pa., and the Foxboro Co., New York, before joining the Scharff staff in 1932.

▶ B. R. TEARE, JR., formerly assistant professor of electrical engineering, Yale University, has been appointed to the faculty of Carnegie Institute of Technology to direct a newly organized program of graduate study in electrical engineering.

▶ D. C. JACKSON, JR., has been appointed dean of the college of engineering at the University of Notre Dame, Notre Dame, Ind. In the course of his academic career Mr. Jackson has been connected with the teaching staff of the University of Missouri, Trinity College, now Duke University; University of Louisville, University of Kansas and the Lewis Institute, Chicago. During recent months he has been working with his father, Dr. Dugald C. Jackson, on a survey of engineering education conducted by the Engineers' Council for Professional Development.

Stein Assigned Broader Duties by Allis-Chalmers

Harold J. Stein, research engineer of the manufacturing department of the Allis-Chalmers Manufacturing Co., has been appointed director of research, chemistry and metallurgy of the manufacturing department of the company. Ralph S. MacPherran, chief chemist for many years and identified with the iron and steel industry for nearly 50 years, is retiring from active service with the company.

Mr. Stein joined Allis-Chalmers as a graduate student apprentice in 1916 and during his period of training served in the various manufacturing departments, including detail, erection and test. Working in the forging department, he was later foreman of the trac-

tor heat-treating department and then general foreman of all the company's heat-treating operations. Then he was advanced to assistant superintendent of the forge department and later to assistant research engineer of the manufacturing departments of the company.

Mr. MacPherran has been with Allis-Chalmers since 1895, having started with the old E. P. Allis Co.

ORANGEBURG HAS *long* BEEN PART OF

© Fairchild Aerial Surveys, Inc.

Cincinnati's advantageous industrial position on the banks of the Ohio also exposes it to the vagaries of that river. The flood of last year saw its waters 15 feet above street level in the lower part of the town.

ORANGEBURG NOCRETE
—costs less—
—gives more—

Costs less than "buried" cable
Costs less than other Conduits
Costs less to install
Gives more cable protection
Gives more service facilities
Gives longer, trouble free, service

There are many more
ORANGEBURG Points that Count

The Orangeburg trademark is a guarantee of the best of Fibre Conduits, a time-tested, enduring "service" of cable protection *wherever electrical raceway facilities are to be installed underground.*

- The underground distribution systems of Cincinnati, both "electrical" and "telephone" are largely ORANGEBURG.

ORANGEBURG installations early in the century are in service today, surviving the last and many previous floods, ready for additional decades of trouble-free service.

Of particular interest is the Cincinnati & Suburban Bell's practice of installing Orangeburg without concrete encasement. ORANGEBURG NOCRETE, now especially built for this rugged service, is a development based on their decades of successful experience.

Watertight, chemically resistant and of great mechanical strength, ORANGEBURG provides permanent cable protection at the lowest ultimate cost. Continuity of service is evidenced by installations made 40 and more years ago that still provide 100% cable protection, clear, usable raceway.

For installation underground with CONCRETE ENCASEMENT: ORANGEBURG STANDARD FIBRE CONDUIT is recommended for duct banks (4 ducts and over), main distribution, high tension and "downtown" locations.

For installation WITHOUT CONCRETE ENCASEMENT: The ORANGEBURG dual-economy NOCRETE Conduit is recommended for service entrances, extensions, parkways, and street lighting, suburban distribution, laterals, signal systems, etc.

Sales Agent—Distributors

GENERAL ELECTRIC SUPPLY CORP. **GRAYBAR ELECTRIC COMPANY INC.**

MADE AT ORANGEBURG, NEW YORK
BY THE FIBRE CONDUIT COMPANY
292 MADISON AVE. NEW YORK CITY

ORANGEBURG *Standard* for installation *with* concrete encasement
NOCRETE for installation *without* concrete encasement

for high compression at low torque

● There's no such thing as slippage inside the new streamlined Fargo "6000" Connector. At low torque its vise-like grip holds conductors in perfect, permanent contact. Fargo high compression at low wrench torque assures maximum pressure between conductors with less possibility of damage to threads. That's one reason why you can expect extra years of service and more repeat use from Fargo "6000" Connectors. Now available in No. 6 and No. 4 sizes, with other sizes available later.

MADE BY FARGO MFG. CO.
DISTRIBUTED BY
LINE MATERIAL CO.

▶ RAYMOND BAILEY, assistant electrical engineer Philadelphia Electric Co., has been appointed chairman of the A.I.E.E. committee on power transmission and distribution for 1939-40.

▶ L. E. COOK, formerly supervisor of distribution, Texas Power & Light Co., Dallas, has been employed by Ebasco Services, Inc., New York, as electrical engineer.

▶ JOSEPH HAGENDORN, electrical inspector, New York Board of Fire Underwriters, Hewlett, N. Y., was elected president of the eastern section of the International Association of Electrical Inspectors at the recent annual meeting in Providence, R. I.

▶ R. O. WATSON has been made sales manager of the transportation and generator division of the Westinghouse Electric & Manufacturing Co. to succeed MAX KENNEDY, who has been assigned to sales activities in the Middle Atlantic district. Mr. Watson has been associated with Westinghouse since 1911. He was connected with the East Pittsburgh works, with the testing department, industrial sales department and following seven years' association with the large motor and synchronous motor section, he was transferred to the generator sales department in 1936 as manager of the motor section. A year later he was promoted to the position of manager of the department.

▶ CHARLES G. PYLE has been appointed sales manager of the Hygrade lamp division, Hygrade Sylvania Corp., Salem, Mass. Mr. Pyle fills the vacancy left by the retirement of S. N. Abbott, under whom he served for years years as assistant sales manager. His connection with the Hygrade Sylvania Corp. dates back to 1920, when he first joined the sales force. Since that time he has served as district manager of Hygrade lamp division in many sections of the country. For the present he will continue to work from Hygrade's Chicago office, but eventually plans to establish his headquarters at the New York Office.

▶ W. H. ARMACOST has been given the responsibility for engineering development in the marine department of Combustion Engineering Co., in addition to his previous duties in connection with stationary equipment. The growing importance of the marine field has made necessary increased personnel in that department, of which Commander H. T. Dyer is manager. H. S. COLBY, for the past five years general sales manager of the company, has been delegated with executive responsibility for the conduct of the company's marine business and will devote his entire time to that work. DONALD S. WALKER, formerly manager of the Philadelphia district, has been appointed general sales manager. He will be assisted by Otto deLorenzi and G. H. Ebdon, the latter formerly of the New York district sales office, as assistant general sales managers.

▶ H. C. ELLMAKER has become assistant electrical engineer, United States Engineers Office, Los Angeles, Calif. He was formerly recording engineer with the engineering firm of Batsley and Phillips, Los Angeles.

▶ E. W. LLOYD, vice-president Commonwealth Edison Co., Chicago, has been granted a leave of absence until December 31, 1940, because of ill health. G. A. FREEMAN, assistant to Mr. Lloyd, will be acting head of the sales departments in his absence.

▶ E. W. ALLEN, formerly sales engineer for Thomas A. Edison, Inc., West Orange, N. J., has been appointed to the newly created position of manager of engineering. As such, Mr. Allen will be executive head of the factory engineering and sales engineering departments. W. M. Schleicher, formerly Mr. Allen's assistant, has been promoted to the position of sales engineer. W. H. Patterson, chief engineer, continues in his present position as head of the factory engineering department. J. E. Schmidt, formerly superintendent of manufacturing, has been appointed to the newly created position of manager of the production department. In this capacity he will head a consolidation of the former manufacturing and sales production departments.

▶ P. Y. TUMY has succeeded A. L. POND as manager of General Electric Co.'s Milwaukee office. After 25 years of service as manager of that office, Mr. Pond has asked to be retired. He will continue in an active advisory capacity until the end of the year. MERRITT LAWRENCE has succeeded Mr. Tumy in charge of the Grand Rapids office. Mr. Tumy has been connected with General Electric since 1909. He has been resident agent of the Grand Rapids office since 1917. Mr. Lawrence became identified with General Electric in 1918. Since 1922 he has been connected with the Grand Rapids office.

▶ F. H. BLACKBURN, manager of investment trust funds for employees of the General Electric Co., has asked to be relieved of his responsibilities. He will retire, after more than 40 years of service, under the pension plan of the company. In this capacity he will be succeeded by Ralph Beman, an associate on investment matters for many years. Mr. Blackburn became associated with the Fostoria Incandescent Lamp Co. in 1896. When that company joined

with several others to form what later became the national lamp division of the General Electric Co. Mr. Blackburn became chairman of a group interested in their manufacturing activities, serving in this capacity for almost 20 years. He became active in the home office of the national lamp division, organizing the incandescent lamp standardizing department, of which he was manager for several years. Of late years he has been devoting all his time to investment affairs.

▶ ZAY JEFFRIES, technical director, incandescent lamp department, General Electric Co., Cleveland, Ohio, has been elected to membership in the National Academy of Sciences.

▶ JAMES GALBRAITH, chief electrical inspector for the city of Detroit, was recently elected president of the western section of the International Association of Electrical Inspectors.

OBITUARY

W. J. Hanley

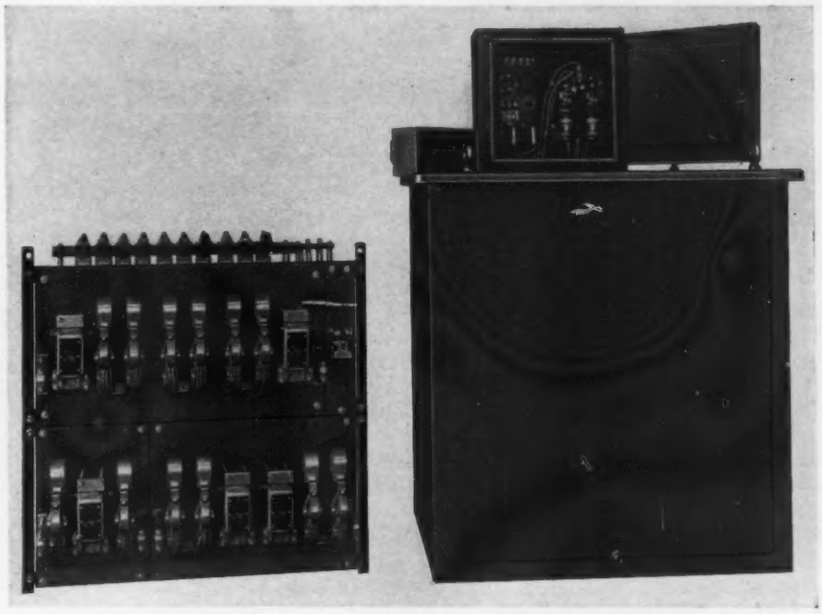
William J. Hanley, commercial vice-president of the General Electric Co. with headquarters in Cleveland, died in that city November 9, at the age of 72, after completing 51 years of service with General Electric. One of the veteran commercial men in the company, Mr. Hanley was honored last year with a diamond-studded Quarter Century Club pin in recognition of his completion of fifty years of continuous service.

Mr. Hanley began his service in 1888 with the old Thomson-Houston Co. in Ohio as a construction foreman. The following year he entered the railway department of that company. When the General Electric Co. was formed in 1892 by the union of the Thomson-Houston Co. and the Edison General Electric Co., Mr. Hanley continued with the new company. In 1903 he became a member of the supply department of the company's Cincinnati office. In 1905 he was appointed manager of the Columbus office. In 1915 he became manager of the east central district, a position he occupied until the time of his death. In 1929 he was elected a commercial vice-president of General Electric.

•

▶ EDWARD E. HARDY, assistant manager, Jackson (Mich.) division, Consumers Power Co., died October 15, at the age of 41. Mr. Hardy had been connected with the company for fifteen years. Before becoming assistant manager of the Jackson division Mr. Hardy was industrial gas engineer for the Consumers Power Co. in Jackson.

EC&M STARTER for LONG-TIME STARTING OF SCAVENGER BLOWER DRIVE



Acceleration by EC&M NEO-TIME Control

THIS illustration shows an EC&M Oil-immersed, Auto-transformer Starter for reduced voltage starting of a 350, 440 Volt motor driving a scavenger blower in a municipal diesel plant. Starting current is kept low by providing a heavy duty starter capable of long-time acceleration on the auto-transformers. Transition from reduced voltage to full line voltage is by EC&M NEO-TIME Control which is conveniently located in overload relay compartment. View of right shows enclosing cover for NEO-TIME panel setting on oil-tank cover.

View at left above shows EC&M Type LZ Magnetic Contactors for handling the main motor circuit. They are mounted in the oil-tank with auto-transformers and are completely oil-immersed. During transition, the circuit to the motor is not broken; instead, continuous torque is applied to the motor from the instant of starting.

EC&M Booklet No. 88 illustrates this attractive unit as well as many other custom built motor controls. Write today for your copy.

THE ELECTRIC CONTROLLER & MFG. CO. CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS.

THE ELECTRIC CONTROLLER & MFG. CO.
2708 E. 79th St., CLEVELAND, OHIO

Gentlemen:
Please send me a copy of illustrated Booklet No. 88 describing EC&M 110 to 2300 volt Motor Starters.

Name.....

Company.....

Address.....

MANUFACTURING - MARKETS

$20,772 Net Shown by Emerson Electric

In the annual report to stockholders, issued last week, W. S. Symington, president of Emerson Electric Manufacturing Co., St. Louis, stated that the company for the fiscal year ended September 30 showed an operating profit of $109,317, against an operating loss of $106,120 for the 1938 fiscal year. Net profit for the 1939 fiscal year before income taxes is reported at $20,772.

Unfilled orders of the company as of September 30 were the largest for any year-end in the company's history.

According to the report, Emerson Electric has recently diversified its line by entering the field of arc welding through the purchase of welder assets of another corporation. The company has likewise developed new lines of motors having a year-round market, as an offset to the seasonal character of the electric fan business. In 1940, according to Mr. Symington, the company will celebrate its fiftieth year of operation.

•

Prices Held Steady

The new price sheet of Wiremold lighting and wiring equipment, raceways and fittings, just issued to the trade, shows unchanged prices on the great majority of items listed. Equipment for installation of fluorescent lighting has been reduced approximately 20 per cent. D. Hayes Murphy, Wiremold president, expressed the hope that it will not be necessary to raise prices, but any increase will be held in line with increased material costs.

•

Shipments up 48%

Norge division of Borg-Warner Corp. in October shipped 21,259 units to distributors, 48 per cent more than a year ago. Refrigerator shipments were up 83 per cent, washers 41 per cent and space heaters 104 per cent. September unit shipments were 26 per cent ahead of last year.

•

Appoints Export Group

Allis-Chalmers Manufacturing Co. has appointed a committee to consider business problems which have arisen in Europe since the outbreak of war, according to Max W. Babb, president. W. E. Hawkinson, treasurer, is chairman of the group. This export committee will consider questions of policy in relation to foreign business.

•

Westinghouse Acquires Business of Front Co.

Purchase of the business of the Front Co., 26-year-old electrical house at Wheeling, W. Va., by the Westinghouse Electric Supply Co. has been announced by Bonnell W. Clark, president of the Westinghouse company. The steadily increasing market for electrical equipment in this district was given by Mr. Clark as the major reason for the purchase of the local business and the establishing of an important branch of the Westinghouse distributing organization there.

It was stated that S. S. Front, formerly president of the Front Co., would become a branch manager of the Westinghouse organization and the Front personnel would be retained.

•

Restores Pay Cuts

Graybar Electric Co. has announced the restoration of salary reductions and the lump sum payment up to date of the entire reduction so far this year. This restoration affects all employees except those in minor positions who had not been affected by the reduction.

September Quarter Profits Increase

Among the electrical manufacturing companies recently issuing corporate statements are the following:

SQUARE D—Nine months to September 30: Net profit, $556,209, equal to $1.62 each on 343,860 shares of $1-par common stock, against $208,522, or 60 cents a share, last year. September quarter: Net profit, $257,829, equal to 75 cents a share, against $187,781, or 54 cents a share, in second quarter this year and $92,194, or 27 cents a share, in third quarter of 1938.

ANACONDA WIRE & CABLE—September quarter (preliminary): Net income, $150,423, equal to 36 cents each on 421,981 capital shares outstanding, against $97,057, or 23 cents a share, in the September quarter of 1938.

NATIONAL POLE & TREATING—September quarter: Net loss, $19,792, against $23,903 loss in June quarter and one of $18,912 in September quarter a year ago. Nine months to September 30: Net loss, $53,162, compared with a net loss of $104,656 last year.

•

Electrical Goods Orders Gain 30% Over Year Ago

Orders booked for electrical goods during the third quarter, as reported by 78 manufacturers, totaled $212,001,139, as against $205,567,343 during the second quarter and $158,958,951 during the third quarter of a year ago, according to the Department of Commerce.

Orders booked during the first three quarters totaled $615,222,698, more than 30 per cent better than those reported for the same period a year ago and comparing with a total for the year 1938 of $630,801,957.

•

Calls Class A Stock

Weston Electrical Instrument Corp. has called for redemption on January 1 all outstanding class A stock at $37.50 a share and accrued dividends to January 1.

"WHEN I HAVE TO MAKE RECOMMENDATIONS for the purchase of all kinds of electrical equipment, I just haven't time to dig through a flock of miscellaneous printed matter to find the catalogs I want. I have to get basic buying data in a hurry.

Thanks to the many manufacturers who have prefiled their catalog data in Electrical Buyers Reference, I can usually find the data I need at the moment I must have it. You bet I'd miss my copy of Electrical Buyers Reference."

"I'D MISS IT *as much as my slide rule!*"

★ ★ ★ ★ ★

BE SURE YOU MAKE as effective use of your copy of Electrical Buyers Reference as other electrical men are doing. You, too, will find it saves time and money.

It cuts out all guesswork as to where to look to find the products you want in a hurry. No juggling and thumbing through dozens of catalogs. In one handy volume you have data on thousands of products made by hundreds of manufacturers . . . instantly, accurately.

ELECTRICAL WORLD EDITION

Electrical BUYERS REFERENCE • 330 WEST 42nd ST., NEW YORK

A Unit of the McGraw-Hill Reference Service

Bonneville Awards Material Contracts

Announcement has been made by the Bonneville Administration of the awards of contracts totaling $731,637 for labor and materials to be used in extending the power network.

The largest orders went to low bidders on materials for Bonneville's 107-mile, 220,000-volt circuit between Kelso and Seattle—$387,444 to the Aluminum Co. of America, Pittsburgh, Pa., for steel reinforced cable, and $380,221 to the American Bridge Co., Pittsburgh, for tower steel.

Contract for construction of a 110,000-volt line from Chehalis to Raymond to serve the Pacific County public utility district went to the Electric Construction Co. of Seattle for $55,287.

•

Manufacturers Make Sales Assignments

Electrical manufacturing companies have made the following appointments to their sales staffs:

R. C. PURDY, who was formerly connected with Turrell & Benfield of Detroit, has formed the Purdy Electric Sales Co. and will represent the Goodrich Electric Co. in northern Ohio territory. He will handle Goodrich industrial lighting equipment. Harry Q. Beven, formerly with Crouse-Hinds for the past fifteen years, has been appointed sales representative in Wisconsin by Goodrich Electric Co.

Edison General Electric Appliance Co., Inc., has established a new distributing branch in Buffalo, N. Y., where a complete display of home appliances will be maintained at headquarters located at 887 Main Street. Charles H. Griffith has been appointed manager of the new branch by R. W. Turnbull, Hotpoint vice-president and general sales manager.

•

General Electric Exhibit

General Electric Co. reports that 2,694,165 persons saw the man-made lightning exhibit at the New York World's Fair during the past season. More than 1,400,000 attended the "House of Magic" and no tab was kept on the attendance at other parts of the exhibit. The exhibits will be substantially the same when the fair reopens May 25, 1940.

New York Metal Prices

	Nov. 14, '39 Cents per Pound	Nov. 8, '39 Cents per Pound
Copper, electrolytic	12.50*	12.50*
Lead, Am. S. & R. price	5.50	5.50
Antimony	14.00	14.00
Nickel, Ingot	35.00	35.00
Zinc Spot	6.89	6.89
Tin, Straits	51.00	52.25
Aluminum, 99 per cent.	20.00	20.00

*Delivered Connecticut Valley.

Field Reports on Business

Electrical manufacturers report a further advance in business, with utilities placing more diversified orders. Industrial business is good. Utility construction budgets indicate heavy purchases will be made next year. Appliance sales show some expansion, with good trade indicated for the Christmas holidays. Prices rule steady.

NEW YORK

The election day last week slowed down industrial activity slightly, but the normal recovery was in evidence this week, with many plants showing progressive gains over preceding weeks. Electrical manufacturers are very active and are noting a second buying wave following the let-down after the war rush in September. Opinion is that should this second wave continue, with additional pick-up expected when 1940 utility construction budgets are approved, there is little likelihood of a spring let-down.

So far electrical manufacturers have on their books for private utilities more than a million kilowatts of new generating capacity for delivery next year and a like amount for delivery in 1941. Orders for industrial electrical equipment continue to swell backlogs. While the Washington scene changes rapidly, there are signs that nothing will be done to cause an upheaval in the utility picture and disrupt construction programs. Chances are that encouragement will be given to open the capital markets for new financing.

Utility appliance sales campaigns now under way and planned for next year indicate that appliance manufacturers will report 1940 as another record year in sales. Retail establishments are counting on electrical gifts for Christmas trade.

NEW ENGLAND

Electrical equipment buying in this district during the past week continued at a strong pace and negotiations now being studied indicate that manufacturers have every reason to face the coming season with optimism. Estimates conservatively count more than $250,000 in motor-driven machine tools bought by the government in this district during the past fortnight; nor is this figure an isolated case. During the past week Connecticut industries booked contracts totaling $1,243,666.

Small motor buying is steady; central-station supplies are moving in good volume and factory expansion in the Boston area has stimulated industrial lighting interest to a marked degree and, according to one engineer, more than doubled proposed lighting projects during the past month. Wire and cable orders are heavy; Simplex Wire & Cable Co., Cambridge, Mass., received, last week, an order for copper cable amounting to $16,040 and reports increases in negotiations.

Street lighting is progressing, with attention being directed to improved lighting on state highways and park systems. Plans are being considered for installing new type sodium-ray lights along a section of the Quincy (Mass.) Shore Boulevard and Christmas illumination plans are being advanced in a number of Massachusetts cities.

Large amounts of wiring supplies for light and power are to materialize through the awards of several unusually large contracts. M. S. Kelliher Co., Boston, has been awarded the Lowell (Mass.) housing project for $1,911,000; Northam-Warren Corp. has begun the construction of a new factory at Stamford, Conn., which will cost $1,000,000 and George A. Fuller Co. has been selected as general contractor by the National Fire Insurance Co. to construct a new office building at Hartford, at a cost of $2,000,000.

Merchandising is encouraging; appliance orders are gaining and December buying is forecast at considerable improvement over past weeks due to more stable industrial conditions throughout this area.

PACIFIC COAST

For the third successive year Pacific Gas & Electric Co. will spend $25,000,000 in 1940 for system extensions and replacements, topped by a new hydro plant of probably 67,000 hp., location not yet decided, for completion in 1942. During the past year several hitherto remote districts have been served by new lines and several pioneer sections of wooden flume relocated through rock tunnels, such as the 5-mile tunnel, costing $1,500,000, replacing 7½ miles of flume to the Colgate plant. Industrial business includes a biscuit plant for Oakland, a new cold roll steel mill at Pittsburgh, contemplated heavy expenditures at five coast shipyards which have recently received contracts averaging four cargo carriers apiece, and cement plant purchasing for additional electrical machinery to handle Shasta and Friant requirements, totaling over six million barrels.

New major government construction includes a complete installation for hangars, shops, storehouses and power plant for new naval air station at Tonguepoint, Ore.

Shortages of highspot standard wiring and roughing-in items are developing along the coast, apparently as a result of heavy ordering from contractors and wholesalers.

CHICAGO

Electrical manufacturers report a further advance last week in the volume of orders received, bringing the rate of activity to the highest yet attained during the current expansion. The present accumulation in many companies is sufficient to sustain activity at a high level beyond the end of the year. Electrical power output registered another substantial increase over the previous week to a level 21.4 per cent above a year ago.

Utility buying continued at a comparatively active rate, with every indication that the upward trend will be maintained. Wholesalers report considerable increase in turnover, with a large amount of forward buying in holiday merchandise, particularly. Contractors are more active, especially on industrial work, while dealers' sales of appliances show steady improvement. Lighting equipment sales are especially good, with interest in fluorescent units continuing at a high level.

Retail trade continues to expand at an encouraging pace, sales last week showing an increase of 12 per cent over this time last year. Industrial employment and payrolls last month increased from 10 to 15 per cent over October, 1938.

Municipal Plants

NORTH BALTIMORE, OHIO—Central Light & Power Co. has asked the Wood County Common Pleas Court to issue an injunction restraining officials of the village from issuing bonds for the construction of a municipal power plant, contending that a recent Ohio law forbids municipalities from issuing bonds for the purpose of competing with an existing public utility. The bonds were approved by voters last February, but the project has been delayed by a number of legal actions.

ADAMS, WIS.—State Public Service Commission has ruled that the city should pay $36,000 to the Wisconsin Power & Light Co. to take over the power plant in that city. The commission fixed a price of $30,000 in 1935. Since that time the acquisition has been in the courts. In 1930 Adams voted to buy the electric utility property owned by Wisconsin Power & Light, but the acquisition case was delayed not only by court proceedings but by the city's requests for postponement. The commission in its recent decision ruled that the compensation fixed by the 1935 order was not $30,000, but $30,000 plus—"the value of general equipment, materials and supplies on hand at the time of payment of the purchase price and less or plus the net additions or retirements." Net additions to the property in Adams since 1935 were found to be slightly more than $5,000 and the value of supplies on hand about $1,000.

•

Recent Rate Changes

WISCONSIN ELECTRIC POWER CO.'s new rate schedule negotiated with the state Public Service Commission, giving commercial customers in Milwaukee a saving of $126,300, is not satisfactory to certain users. A spokesman for 42 business organizations, embracing 25,000 customers under commercial rates, declared themselves dissatisfied with the rate reduction ordered October 27 in the Milwaukee area by the state commission. The group plans to file a petition in a short time demanding a much more drastic cut. The reduction, the second in ten months, was negotiated by the commission with the Milwaukee utility after the commission had determined that the company was earning in excess of 6 per cent. With the recent cut the new rate in the Milwaukee area will be 75 cents fixed charge monthly, plus 3.25 cents for each of the first 250 kw.-hr. used, 3.1 cents for each of the next 750 kw.-hr., 3 cents for each of the next 3,500 and 2.5 cents on all over 4,500 kw.-hr. used monthly. Spokesman for the business organizations, George E. Bernecker, president of the West National Avenue Advancement Association, said the commercial users would demand the same rates granted to residential consumers—3 cents for the first 50 kw.-hr., 2½ cents for the next 50 kw.-hr., 2 cents for the next 100 kw.-hr. and 1.75 cents for everything over 200 kw.-hr.

KANSAS CITY POWER & LIGHT CO.'s new electric rate schedule, which it is estimated would result in a total annual saving of $335,614 to customers in Kansas City and 40 near-by communities, has been approved by the Missouri Public Service Commission. The reduction, ordered by the commission August 10, will become effective November 15.

LAFARGEVILLE ELECTRIC LIGHT CO. has filed a general reduction of electric rates with the New York Public Service Commission which is estimated to save consumers about $826 annually. The new rate is effective November 25.

LAKE SUPERIOR DISTRICT POWER CO.'s reduction in electric rates, totaling $29,375, has been approved by the Wisconsin Public Service Commission. The reduction will save home users of electricity $14,375 a year and commercial users $15,000 a year.

MT. HOREB, WIS., municipal electric utility, purchased by the village October 1 from the Mt. Horeb Electric Co., a subsidiary of the Wisconsin Power & Light Co., has been granted permission by the state Public Service Commission to reduce rates to commercial customers for an annual saving of $600. The commission has also approved a rate reduction for customers of the CUBA CITY municipal electric utility representing an annual saving of approximately $550 a year.

ILLINOIS COMMERCE COMMISSION has announced that electric rate revisions effective during the month of October in the state of Illinois resulted in an estimated aggregate reduction of $18,044.

JERSEY CENTRAL POWER & LIGHT CO. has reduced its electric rates $180,000 annually, according to an announcement by Harry Bacharach, chairman of the New Jersey Public Utility Commission. Earlier this year Jersey Central effected an electric rate reduction saving users $73,114.

•

Provides for Employees in Military Service

In an announcement recently issued Paul F. Sise, president of the Northern Electric Co., Ltd., outlined the company's policy with regard to those employees who enter military service.

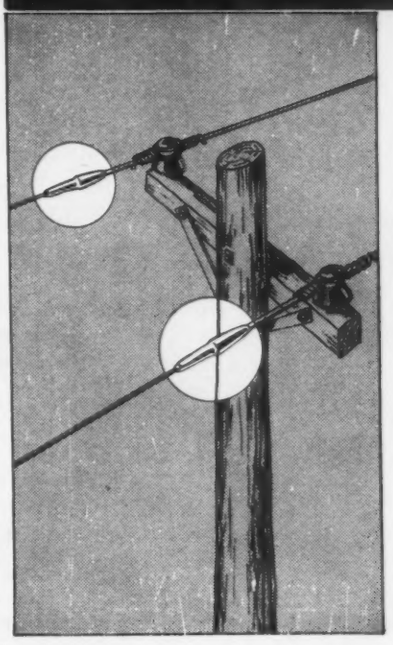
Any employee in the company's employ on August 31, who enters service, shall be granted leave of absence together with employment on his return. Such service would be included in connection with the payment of company service pensions and death benefits under the company's plans. The company has agreed, on behalf of the dependents of married employees and dependent children of employees who are widowers, to make payments (not exceeding one-half of the employee's salary) which together with Canadian service pay and allowances, will equal the previous earnings of the employee.

•

Canadian Output Advances

Output of central electric stations in Canada during September totaled 2,379,811,000 kw.-hr., compared with 2,292,223,000 kw.-hr. in August and 2,168,435,000 kw.-hr. in September, 1938. Production was the second largest of the year to date, but percentage increase over the same 1938 month was the year's smallest, according to the Dominion Bureau of Statistics. Exports to the United States were 159,713,000 kw.-hr., compared with 178,734,000 in August and 151,691,000 kw.-hr. in September a year ago.

modernize
YOUR
DISTRIBUTION
PRACTICE—



Urban construction where line drops portion of load and smaller wire size will carry current flowing through the rest of circuit.

RELIABLE
STRAIGHTLINE
REDUCERS . . . .

Save money and clean up appearance while eliminating a double dead-end. Sag of larger wire is only increased two or three inches as spans of city distribution are short.

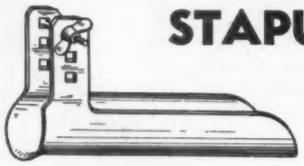
Reliable
ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES

Hot Rolled Copper Rods • Bare and Tinned Strand
Bare and Tinned Copper Wire
(In Rounds, Flats and Squares)
URC Weatherproof Wire
Cotton, Paper and Asbestos Magnet Wire
(In Rounds, Flats and Squares)
Rubber Insulated Wires and Cords
Lead Covered Cables • Multiconductor Power Cables
Network, Service Entrance, Control Cables

ROME-60
ROME CABLE CORP. ROME, N.Y.

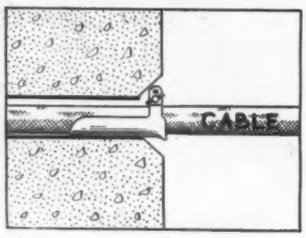
That New, Tough, 60% Jacketed, Heavy Duty Portable Cable

ROME CABLE
CORPORATION
ROME, N.Y.
SALES OFFICES:
New York Chicago Cleveland Pittsburgh Detroit
Boston Richmond Philadelphia Los Angeles



STAPUT FAIRLEADERS

- *Prevent Cable Abrasion*
- *Cut Installation Costs*
- *Longer Service-Life*



Staput Fairleaders are especially designed to eliminate cable abrasions at the duct mouth. They save you money in the installation—cutting labor time to 2 minutes. Rigid laboratory tests indicate a service-life of *200 years!* Made of ZINC to protect lead cable covering from electrolytic action. Held firmly by cadmium plated bolt and wing nut. Standard in underground systems of many progressive light and power companies.

Write today for detailed description.

WILLIAM B. BERRY CO.
100 NORTH ST. BOSTON, MASS.

"Every time we've put a line through that industrial section we've had insulator trouble."

"Read what the NEW LAPP CATALOG says about fog and smoke. We'll have the answer this time."

IF YOU HAVEN'T GOT A NEW LAPP CATALOG WITHIN QUICK REACH, YOU NEED IT . . . WRITE LAPP INSULATOR CO., INC., LEROY, N. Y.

Sales Opportunities

IOWA CITY, IOWA—Iowa City Light & Power Co. plans extensions in transmission lines in parts of Johnson County. Application has been made for permission. Work scheduled to begin soon.

DETROIT, MICH.—Detroit Public Lighting Commission has plans under way for extensions and improvements in street-lighting system, including feeder lines, conduits, controls, standards and other installation. Fund of $732,611 has been secured through federal aid for work. This is an expansion of present similar project in progress for a number of months. Louis J. Schrenk is general manager for commission.

CARLSBAD, N.M.—International Agricultural Corp., 61 Broadway, New York, N.Y., plans installation of power substation equipment, switchgear, motors and controls, conveyors, electric hoists, loaders and other equipment in new potash mining and milling plants in vicinity of Carlsbad, where company has lease on extensive tract of potash lands. Plant will have rated capacity of about 140,000 tons of refined material per annum. Cost estimated close to $2,000,000. Union Potash & Chemical Co., Carlsbad, an affiliated interest, will be in charge of project.

CENTREVILLE, MD.—Board of Town Commissioners plans extensions in primary and secondary lines in parts of Queen Anne's County, with service facilities for expansion in rural electric system. Permission has been granted and work will proceed at early date.

DAYTON, OHIO—Dayton Power & Light Co. has approved plans for two new indoor power substations, to be located on Overlook Avenue and in Osborne district, respectively, and will proceed with erection soon. Company also has plans for new one-story control station, 25x50 feet, at Miller's Ford steam-electric generating station.

CHATTANOOGA, TENN.—Chattanooga Electric Power Board will take bids soon for new service and operating building on 7-acre tract of land bounded by Holtzclaw and Greenwood Avenues, Oak and East Fifth Streets, including line headquarters, underground department, meter service and repair divisions, equipment storage and distributing departments, and other operating divisions. Cost estimated about $260,000, of which $118,350 will represent a federal grant. R. H. Hunt, Chattanooga Bank Building, is architect. S. R. Finley is general superintendent.

SPENCER, NEB.—Nebraska Hydroelectric Power Co., St. Paul, Minn., care of St. Paul Mercury Indemnity Co., 111 West Fifth Street, St. Paul, recently organized to take over property and assets of former Northern Nebraska Power Company, Spencer, plans rebuilding and improving of hydroelectric generating plant of latter company near Bristow, vicinity of Spencer, which has been shut down since power dam was washed out several years ago, and following which the Northern Nebraska company, noted, discontinued operations. Power dam will be rebuilt and generating station modernized, with installation of new equipment, including transmission line for connection with system of Interstate Power Co. of Nebraska, Dubuque, Iowa, which will contract for entire output of station, as well as secure option to purchase such power plant within a certain period of time following resumption of operation. New company is identified with bondholders of former Northern Nebraska company, including St. Paul Mercury company, men-

tioned, and St. Paul Fire & Marine Insurance Co., same address, and proposes to arrange a bond and stock issue to total $415,000, a considerable part of fund to be used for station reconstruction and modernization. Application for permission to proceed with project has been made to Nebraska State Railway Commission and early hearings are scheduled.

NASHVILLE, TENN.—Aviation Manufacturing Corp., 420 Lexington Avenue, New York, N.Y., plans installation of power substation equipment, switchgear, motors and controls, electric heat-treating apparatus, electric hoists, conveyors, loaders and other equipment in new aircraft-manufacturing plant on 36-acre tract of land near Berry Field municipal airport, Nashville, recently acquired. Main unit will be one-story, 300x405 feet, with several smaller plant structures and two-story administration building. Cost close to $1,000,000. Work is scheduled to begin soon. Albert Kahn, Inc., New Center Building, Detroit, Mich., is architect and engineer; Marr & Holman, Nashville, Tenn., are associate architects.

OMAHA, NEB. — Nebraska Power Co., Omaha, plans extensions in primary and secondary lines in part of Sarpy County, for rural electric system. Permission has been granted.

VERNAL, UTAH—Utah Power & Light Co., Salt Lake City, has approved plans for improvements in hydro-electric power station at Vernal, including installation of new semi-automatic control system. Also will make improvements in transmission and distributing lines in that area.

COLEMAN, TEX.—City Council plans extensions and improvements in municipal electric power plant, with installation of additional equipment. Cost estimated close to $80,000, and bond issue will be arranged in that amount.

BROOKLYN, N.Y.—Signal Corps Procurement District, Army Base, 58th Street and First Avenue, Brooklyn, receives bids until November 24 for 105,000 lineal feet of cable and 105 reels (Circular 142).

SCRANTON, PA.—Scranton Electric Co. has filed plans for new indoor power substation on Olive Street and erection is scheduled to proceed at once. Cost reported over $200,000, including equipment.

SANTA MONICA, CALIF.—Douglas Aircraft Corp., 3000 Ocean Park Boulevard, plans installation of motors and controls, conveyors, electric hoists and other equipment in new one-story addition to airplane-manufacturing plant, 200x250 feet, with mezzanine floor, 50x250 feet. Cost close to $200,000. Proposed to begin erection at once. Edward C. and Ellis W. Taylor, 803 West Third Street, Los Angeles, Calif., are architect and engineer, respectively.

EL CENTRO, CALIF.—Imperial Irrigation District, El Centro, has plans for two outdoor power substations in connection with new 33.000-volt transmission line, on which work is being placed under way at once. M. J. Dowd is chief engineer and general manager.

EVERETT, WASH.—Everett Pulp & Paper Co. plans installation of motors and controls, conveyors and other equipment in new addition to local mill. Cost estimated about $200,000. Work will be placed under way soon.

CLEVELAND, TEX.—Town Council plans extensions and improvements in municipal electrical distribution system, including new power substation and other operating facilities. Estimates of cost are being made.

Group at the '38 Exposition increasing their ability to serve.

SURE, THEY'LL BE THERE!

Thirty thousand strong, they'll be at this great exposition. Who? Thousands of them will be men of the electrical industry who know that their interests demand intimate, up-to-the-minute familiarity with heating, ventilating and air conditioning equipment. Whether their work is buying or selling . . . planning, designing, operating or servicing . . . whether interested in selling power or applying it, here is where they see more and learn more about new developments in air conditioning than they could anywhere else in such a short time.

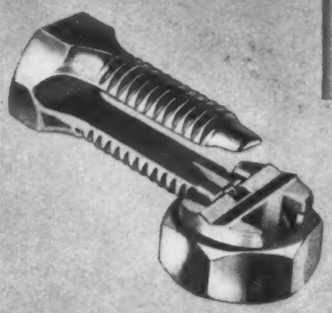
More than three hundred exhibitors will display their new equipment, make demonstrations, answer questions, discuss needs, solve problems.

You are cordially invited. Admission is by registration.

THE AIR-CONDITIONING EXPOSITION
6th INTERNATIONAL HEATING & VENTILATING EXPOSITION
LAKESIDE HALL, CLEVELAND, OHIO
Auspices American Society of Heating & Ventilating Engineers
Management, International Exposition Co.
JANUARY 22-26, 1940

102

Only BLACKBURN *gives you* THESE FEATURES



HINGE-TYPE NUT RETAINER completely concealed within the nut—has no extending parts to be cut off or to interfere with taping—actually guides the nut squarely on the bolt in perfect register with the threads.

100% Duronze—actually stronger than steel and more non-corrosive than pure copper or commercial bronze commonly used in connectors.

Specify Blackburn

JASPER BLACKBURN PRODUCTS CORP.

Main and Clinton Sts. ST. LOUIS, MO.

Crapo GALVANIZED PRODUCTS

Where strains and stresses are heaviest, where corrosion takes its greatest toll, *Crapo* Galvanized Steel Strand and Telephone Wire constantly are proving their outstanding superiority. The heavy, tenaciously bonded zinc coating, maximum tensile strength and correct ductility insure longer life and lower maintenance cost. Insist upon *Crapo* Galvanized Products for better performance under all conditions! Ask your Jobber or write direct!

INDIANA STEEL & WIRE CO.
MUNCIE, ♦ INDIANA

Crapo Galvanized Strand and Telephone Wire can be obtained readily in all standard grades and sizes.

Your name stamped in Gold *on this book* FREE

At no additional cost to you, we will stamp your name, or a friend's name, in gold on the front cover of any copy of Standard Handbook for Electrical Engineers ordered from this advertisement. This is a special Christmas offer, limited to acceptance before January 1, 1940.

STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS

Editor-in-Chief, Frank F. Fowle, Consulting Engineer — Assisted by 91 Specialists

Sixth Edition—2816 pages

THE latest edition of one of the world's leading technical reference manuals. Its 28 big sections, each written by one or more recognized specialists, cover every phase of electrical engineering, giving a wealth of standards, data, description and practice in remarkably compact yet accessible form.

Do you want to make a friend a gift combining personal thoughtfulness with real utility? Do you want a copy of this big Handbook that you will doubly prize? Then take advantage of this free stamping offer. Send the coupon today. (Proper remittance should be enclosed with order and of course, stamped copies are not returnable.)

SPECIAL HOLIDAY OFFER COUPON

McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y. C.

Send me Standard Handbook for Electrical Engineers according to the terms checked:

☐ With name stamped in gold. I enclose $7.00 and understand that stamped books are not returnable. (Offer expires Jan. 1, 1940.)

☐ For 10 days' examination; without gold stamping. I will send $7.00 plus few cents postage in 10 days or return book postpaid. (Postage paid if cash accompanies order.)

Print name to be stamped, here

Name .....

Address ..... Position .....

City and State ..... Company .....

(Books sent on approval in U. S. and Canada only.) W. 11-18-39

Distribution Planning—IV
Fixing Regulator Settings

[*Continued from page 44*]

lated by a group regulator, the equivalent resistance and reactance and the ratio X/R should be determined for the circuit having the smallest voltage drop to the first transformer.

D. This is the primary voltage drop from the regulator to the first transformer. Where several circuits are regulated by a group regulator, this value should be the voltage drop for the circuit having the smallest voltage drop to the first transformer.

E. The constant 1.04 provides compensaiton for a 4 per cent voltage drop beyond the first customer which must be compensated for by the regulator.

Some small regulators have only resistance compensation. In such cases, omit calculations of V_r and V_s and find the resistance compensation from R points $= KV_c$ instead of $R = KV_r$.

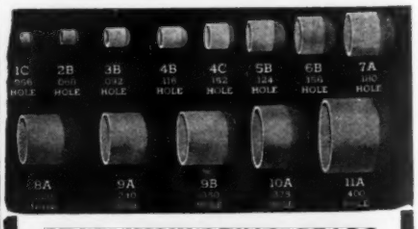
There may be some special cases for which the above calculating method cannot be used, but it is believed that this method will be advantageous for determining most regulator settings. The first transformer method of setting regulators should produce satisfactory voltage regulation and when so desired actual conditions can easily be checked by measuring the primary voltage at the primary of the first transformers.

● "Transformer-Secondary Design for Service" is the subject of the next (fifth) article in a series of six on the technique of distribution design and analysis and will appear in "Electrical World," December 2. Reprints of the six articles collected in a stiff cover binding will be available when the series is completed. Edition will be limited and orders should be sent in early.

•

Increases Voltage

Central New York Power Corp. will increase the voltage to the farm lines west of Oswego with the completion of a new transformer station. The voltage will be stepped up from 2,300 to 4,800 in the rural feeder lines.



STAR INSULATING BEADS

Use Lavolain ball and socket beads for insulating bare wire. Heat resistant. High di-electric and mechanical strength. Made in U. S. A. Quality beads at low cost. Quickly applied. Flexible. Beads shown above are approximately half actual size. Ask for price list and samples.

STAR PORCELAIN CO.
TRENTON, N. J.

Suggests Automatic Rate Adjustments

[*Continued from page 46*]

omy the utilities have developed and by their unremitting efforts in broadening the use of electricity. Obviously there are limits to what can thus be accomplished in the face of rising costs. The general plan suggested should be a way to keep the utilities continuously able financially to perform their service function for the people. By being based on actual performance, rather than mere index numbers, the people should continue to get the benefit of such further economies as can be effected, while at the same time keeping their utility servants strong and capable to furnish the highest quality of service.

A Legacy of Trouble

[*Continued from page 58*]

into the business of producing and selling power with the intention of supplementing government revenues, there might be a very different picture today. Either vast sums would have been saved by *not* going into obviously uneconomic ventures (of which Passamaquoddy is a shining example) or else revenues from TVA and other projects would make those enterprises assets to the Treasury instead of liabilities.

There is no thought here of suggesting that this policy may be reversed, and rates charged for government-produced current which will yield not only interest on the bonds sold to finance them but a little profit. Nothing like that is on the cards.

But by the same token there is going to be considerably more caution, from now on, when it comes to Congress voting more hundreds of millions either to build federal hydro projects or grant huge sums to local communities. The Treasury situation is going to do a bit of tempering of this particular wind to the already-shorn electric industry.

•

Christmas Lighting

Arrangements for appropriate street decorations at Portsmouth, Va., for the coming holiday season have been made by merchants. They will be turned on for the first time the night of November 29.

A FIRE SENTENCED TO DIE

In 3 Seconds!

Here's a sure-handed, dependable weapon against fire. It kills blazes with the fatest known extinguishing agent—carbon dioxide snow-and-gas. It spells sudden death to fire! It harms nothing but fire.

LUX extinguishers and LUX Built-In Systems are *engineered for industry* . . . engineered, in fact, *for the utility industry*. The first carbon dioxide portable extinguisher, the first built-in system . . . both were first applied for protection of public utility properties . . . both were developed by Lux.

Electrical and flammable liquid fires—your worst hazards—are no problem in a Lux-equipped plant. Send the coupon. Get the facts now.

Announcing Kidde-LUX

Easy one-handed operation and trigger action make this new Kidde-LUX Model Two a sensational success against smaller fires. Aim it . . . pull the trigger . . . LUX snow-and-gas smothers the blaze. No pumping to disturb your aim. *Just fire at the fire!* Send the coupon for information on this newest fire-fighter, priced at $10.85.

LUX
SNUFFS OUT FIRE

Walter Kidde & Company
1128 West Street, Bloomfield, N. J.

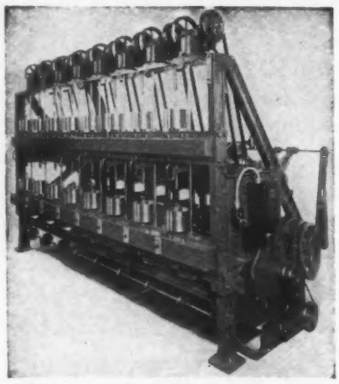
Send me *"Instant Death To Fire"*. I understand it describes the new Kidde-LUX as well as other LUX extinguishers.

Name .....

Company .....

Address .....

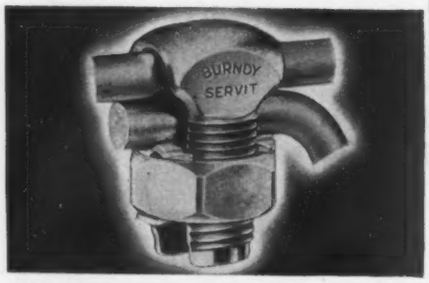
Plain Hoss Sense
+ good basic quality
+ up-to-date design
= SUPERIOR
REG. U. S. PAT. OFF.
★ ★ PRODUCTS
THE SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON, OHIO
★ Manufacturing ★
METER & RELAY TEST SWITCHES
METER & TRANSFORMER ENCLOSURES
METER TEST BLOCKS & TABLES



AIMCO 2D8-MBB Machine
for applying
FIBERGLAS, CELLOPHANE
COTTON and PAPER
Each Unit Individually
Motor Driven
New England Sales Representative:
SIDNEY B. BLAISDELL
228-232 Aborn St., Providence, R. I.

EST. 1933 AIMCO INC. 1939
"American"
AIMCO INSULATING MACHINERY COMPANY
519 West Huntingdon St.
PHILADELPHIA, PENNSYLVANIA, U.S.A.

BURNDY



SERVIT

HIGH GRADE
HARD PORCELAIN
FOR
Electrical Specialties
High and Low Voltages

IMPERIAL
PORCELAIN WORKS
TRENTON, NEW JERSEY

New Funds Allotted for Rural Projects

Allotments totaling $3,325,000 for rural electrification projects in twenty states have been announced by Harry Slattery, Administrator of Rural Electrification. This brings allotments made by REA since it was established in 1935 to $264,798,793.

Details of recent allotments follow:

ALABAMA—Coosa Valley Electric Co-op., Inc., W. J. Pace, president, Talladega, $290,000 to build 326 miles of line, 806 members in Talladega, Calhoun, St. Clair and Shelby counties.

IDAHO—Idaho County Light and Power Co-op. Assn., Inc., Egbert Kabat, acting supt., Grangeville, $143,000 to build 145 miles of line, 330 members in Idaho county. Fall River Rural Electric Co-op., Inc., Walter H. Bratt, supt., Ashton, $89,000 to build 91 miles of line, 245 members in Fremont and Madison counties. Co-operative being formed, Newt Crawford, correspondent, Richfield, $87,000 to build 80 miles of line, 208 members in Lincoln county.

INDIANA—Morgan County REMC, Fred C. Lichtenauer, president, Martinsville, $150,000 to build 145 miles of line, 435 members in Morgan, Monroe, Brown and Owen counties.

KANSAS—Arkansas Valley Electric Co-op., Assn., Inc., A. B. Davis, supt., Sterling, $102,000 to build 113 miles of line, 272 members in Reno, Ellsworth, Rice and McPherson counties.

KENTUCKY—Shelby Rural Electric Co-op. Corp., William C. Dale, supt., Shelbyville, $67,500 to build 65 miles of line, 227 members in Shelby, Henry and Trimble counties.

LOUISIANA—Valley Electric Membership Corp., E. J. Giering, Jr. supt., Natchitoches, $149,000, to build 185 miles of line, 602 members in Grant, Red River, Winn, Natchitoches and De Soto Parishes. Northeast Louisiana Power Co-op., Inc., Winnsboro, Robert E. Holladay, Jr., supt., $104,000 to build 131 miles of line, 415 members in Richland and West Carroll Parishes.

MARYLAND—Choptank Co-op., Inc., C. A. Sennett, supt., Denton, $76,000 to build 80 miles of line, 207 members in Caroline, Queen Annes, Talbot and Dorchester counties.

MINNESOTA—P.I.C.K. Co-op. Electric Assn., Beauford Johnson, supt., Braham, $15,000 to build 18 miles of line, 69 members.

MISSISSIPPI—Yazoo Valley Electric Power Assn., C. N. Blakemore, supt., Yazoo

TRICO COLORTOP FUSES
THE COLOR TELLS THE SIZE
PREFERRED
BY LEADING UTILITIES
The all-colored shock and vent-proof top has contributed enormously to the benefit of Public Utilities in simplifying inspection and as a protection to the public against accident hazards.
When Buying Fuses—Compare Plus Values
Write for Sample
TRICO FUSE MFG. CO.
MILWAUKEE WISCONSIN

City, $84,000 to build 120 miles of line, 265 members in Yazoo, Sharkey, Humphreys and Holmes counties. Delta Electric Power Assn., Robert F. Harrison, supt., Greenwood, $172,000 to build 254 miles of line, 1,056 members in Sunflower, Bolivar, Washington, Leflore, Carroll, Montgomery and Holmes counties.

OHIO—Hancock-Wood Electric Co-op., Inc., A. J. Phillips, supt., North Baltimore, $194,000 to build 215 miles of line, 614 members in Hancock, Wood, Putnam, Hardin, Sandusky, Henry and Allen counties.

OKLAHOMA—**Oklahoma Electric Co-op.,** Edgar W. Cralle, supt., Norman, $50,000 to build 62 miles of line, 136 members in Canadian, McClain, Grady, Oklahoma and Cleveland counties.

OREGON—Coos Electric Co-op., Inc., Ivan C. Laird, president, Coquille, $119,500 to build 99 miles of line, 357 members in Coos county.

SOUTH CAROLINA—**Laurens Electric Co-op.,** Inc., Henry M. Faris, supt., Laurens, $57,000 to build 71 miles of line, 289 members in Laurens, Spartanburg, Greenville and Newberry counties.

TEXAS—Lyntegar Electric Co-op., Inc., Garland L. Pennington, supt., Tahoka, $246,000 to build 318 miles of line, 949 members in Dawson, Martin, Borden, Lynn, Hockley, Garza and Terry counties. Navarro County Electric Co-op., Inc., Clyde Kimes, supt., Corsicana, $75,000 to build 113 miles of line, 308 members in Navarro, Ellis, Dallas and Freestone counties.

UTAH—Garkane Power Co., Inc., Robert A. Middleton, supt., Panguitch, $20,000 to increase the capacity of a generating plant, for which $40,000 has been previously allotted.

VIRGINIA—Shenandoah Valley Electric Co-op., L. E. Long, supt., Harrisburg, $76,000 to build 55 miles of line, 207 members in Rockingham, Augusta and Shenandoah counties.

WASHINGTON—**Okanogan County Electric** Co-op., Inc., Robert J. Murray, attorney, Winthrop, $66,000 to build 47 miles of line, 191 members in Okanogan county. **Big** Bend Electric Co-op., Inc., Harvey C. Sumpter, president, Ritzville, **$267,000 to build** 268 miles of line, 278 members in Adams, Franklin and Whitman counties.

Construction contracts:

MINNESOTA—Freeborn-Mower Co-operative Light and Power Association, Albert Lea, Lewis Brown, supt., and United Engineering Service, Minneapolis, engineer, contract to E. W. Wylie, Inc., St. Paul, Minn., another section of project, 321 miles of line, 680 members; bid $206,941.

MISSOURI—Central Missouri Electric Co-operative, Inc., Sedalia, William F. Schieberl, supt., and R. A. Donahue, Macomb, Ill., engineer, contract to C. A. Hooper, Madison, Wis., and Phelan Construction Co., Davenport, Iowa, for building Sections A and B of project, 391 miles of line, 880 members; bid $270,061. Farmers Electric Co-operative, Chillicothe, Ernest Wood, acting supt., and Frank Horton, Lamar, Mo., engineer, contract to A. A. Electric Co., Cicero, Ill., for building first section of project, 480 miles of line, 883 members; bid $297,681. Co-Mo Electric Co-operative Inc., Tipton, Mo., Jack Needy, supt., and A. Y. Taylor & Co., Clayton, engineer, contract to C. A. Hooper Co., Madison, Wis., entire project, 339 miles of line, 701 members; bid $218,374.

WISCONSIN—St. Croix County Electric Co-operative, Baldwin, Wis., William Rutzen, supt., and Wisconsin Development Authority, Madison, engineer, contract to Holtz Brothers Electric Co., Chippewa Falls, Wis., another section of project. 254 miles of line, 735 members; bid $157,155.

COPPER TO COPPER PREVENTS METALLIC FIGHTS

Forged Copper

8-NU 6-NU 4-NU X2-NU 2-NU 0-NU

Matthews

Nutype Conductor Connectors

FOR COPPER TO COPPER CONNECTIONS

Pure Copper, Cold forged bolt of ample strength for all purposes. High copper content prevents corrosion and season cracking. All edges are rounded. 65,000 pounds tensile value.

"V" groove, clamping jaw of cold forged, pure copper. Flanged sides give greater bearing surface on nut, hence greater strength and no distortion of clamping jaw.

97% copper content, hard metal nut—strong as steel. Full thread engagement with bolt.

Broad, strong head, with size plainly marked. Sides of head have flat surface so wrench or pliers can grip tightly.

85% plus, full thread, die stamped, insures full engagement in nut, hence high strength connectors.

"V" shaped groove, holds wires in three point contact and prevents rocking or looseness.

Made in 12 sizes—6 of forged copper and 6 of machined high strength, high copper content alloy —for No. 10 to 1,000,000 CM conductors.

Send for bulletin and free samples and convince yourself of their superiority.

66-NU 44-NU With Nut

X22-NU 22-NU Retainers

W. N. MATTHEWS CORPORATION

ST. LOUIS, U. S. A.

1939 — FORTY YEARS OF PROGRESS SINCE — 1899

PROFESSIONAL SERVICES

Consulting
Accounting
Valuations

Management
Appraisals
Construction

Designing
Testing
Financing

Inspections
Cost Analysis
Investigations

WILLIAM A. BAEHR ORGANIZATION, INC.

ENGINEERS—ACCOUNTANTS—MANAGERS
231 South La Salle St.
CHICAGO

E. T. L.

TESTS
Electrical, Chemical, Mechanical, Photometric
INSPECTIONS — Materials and Supplies
RESEARCH — Private Labs. for Clients
Electrical Testing Laboratories, New York, N. Y.

Recording & Statistical Corp.

BILL ANALYSIS—CONSUMPTION STUDIES
THE ONE-STEP METHOD
Bill Frequency Analyzer
102 Maiden Lane — New York

BARKER & WHEELER

Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.
11 Park Place, New York City
36 State Street, Albany, N. Y.

FRANK F. FOWLE & CO.

Electrical and Mechanical
ENGINEERS
35 East Wacker Drive — Chicago, Ill.

SANDERSON & PORTER

ENGINEERS
for the
FINANCING—REORGANIZATION—DESIGN—CONSTRUCTION—
of
INDUSTRIAL and PUBLIC UTILITIES
Chicago — New York — San Francisco

BLACK & VEATCH

Consulting Engineers
Water, Steam and Electric Power Investigations, Design, Supervision of Construction, Valuation, Tests and Laboratory Service.
4706 Broadway, Kansas City, Mo.

HOOSIER ENGINEERING COMPANY

Erecting Engineers
Transmission Lines, Substations
46 So. 5th St., Columbus, Ohio
431 So. Dearborn St., Chicago, Ill.
136 Liberty St., New York

SARGENT & LUNDY

Incorporated
ENGINEERS
140 South Dearborn St.
Chicago, Ill.

CHENEY AND FOSTER

Engineers and Utility Consultants
61 Broadway — New York

WILLIAM S. LEFFLER

succeeding
CHARLES F. LACOMBE—WILLIAM S. LEFFLER
Engineers — Economists
Public Utility Management Problems
Economic Audits for Selective Load Building
Balanced Domestic Load Development
Cost Analysis—Rate Cases
30 East 42nd Street—New York

SPOONER & MERRILL, INC.

Consulting Engineers
Design—Supervision of Construction
Reports—Examinations—Valuations
20 North Wacker Drive, Chicago, Illinois

HUGH L. COOPER & CO.

General Hydraulic Engineering, including the design, financing, construction and management of hydro-electric power plants.
101 Park Ave. — New York

J. H. MANNING & COMPANY

ENGINEERING
SERVICES
120 BROADWAY, NEW YORK — FIELD BUILDING, CHICAGO

STEVENS & WOOD

Incorporated
ENGINEERS AND CONSTRUCTORS
30 Broad Street — New York

DAY & ZIMMERMANN, INC.

ENGINEERS
Design - Construction - Management
Investigations and Reports
NEW YORK — PHILADELPHIA, Packard Building — CHICAGO

DANIEL W. MEAD
F. W. SCHEIDENHELM

Consulting Engineers
Hydro-Electric Development, Dams, Water Supply, Flood Control. Engineering Problems relating to Water Rights and Water Power Law. Appraisals.
New York City, 50 Church St.

STONE & WEBSTER ENGINEERING CORPORATION

Design and Construction
Reports • Examinations • Appraisals
Consulting Engineering
BOSTON • NEW YORK • CHICAGO
PITTSBURGH • SAN FRANCISCO • LOS ANGELES

ROBERT E. FOLEY

Erecting Engineer
Rural Lines—Transmission Lines
Fire Alarms—Telephone Lines
48 Griswold St. — Binghamton, N. Y.

ARTHUR L. MULLERGREN

Public Utilities Consultant
Management
Kansas City — Mo.

THE J. G. WHITE ENGINEERING CORPORATION

Engineers—Constructors
Steam and Hydraulic Power Plants
Transmission System—Substations
REPORTS AND APPRAISALS
80 Broad Street — New York

FORD, BACON & DAVIS, Inc.

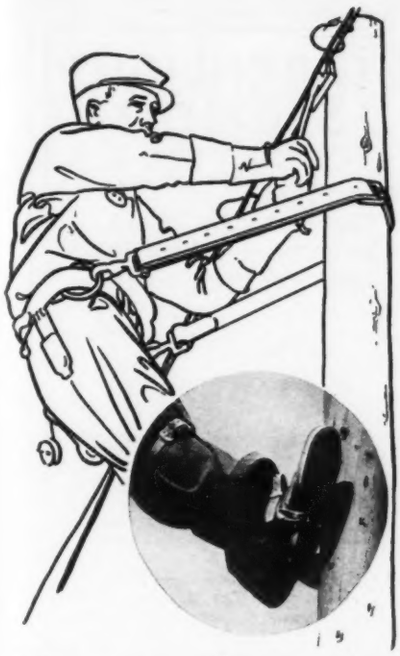
Engineers
DESIGN • CONSTRUCTION
VALUATIONS • REPORTS • INTANGIBLES
Philadelphia — New York — Chicago
Washington — Los Angeles

Do people like you instinctively?

Sensible, practical methods for improving your relations with others—securing cooperation of superiors, associates, and subordinates—both in and out of business life. Send $2.50 for a copy on 10 days' approval.

McGraw-Hill Book Company, Inc.
330 West 42nd St., New York, N. Y.

Read
Getting Along With People
by Milton Wright



How to be sure your climbers are SAFE

With climbers as with other equipment for the lineman there can be no compromise with safety. Kleins are the result of 82 years' experience. Special steels—individual tempering and testing—rigid supervision—assure uniform performance and maximum satisfaction, safety, and over-all economy.

Be sure of safe CLIMBERS. Look for the name—

● Klein's New Lightweight Climbers

● Write for the Klein Pocket Tool Guide

Mathias KLEIN & Sons

Established 1857 — Chicago, Ill. U.S.A.

3200 Belmont Avenue, Chicago, Illinois

LETTERS TO THE EDITOR

New York Power Supply

To the Editor of ELECTRICAL WORLD:

In your editorial of the August 12th issue of the ELECTRICAL WORLD, entitled "Mr. Davidson Is Needlessly Agitated," you oversimplify a somewhat complicated subject.

The information upon which I based my remarks resulted from the conclusions reached by the technical staff of the Power Authority after study of the reports of the various operating companies to the Public Service Commission and the Federal Power Commission. This information indicates that your statement that "So long as there is an excess of 60 per cent (of generating capacity) in the front yard, it seems premature, to put it mildly, to worry about the non-use of what is in the backyard" is wrong. It is wrong because the 60 per cent is wrong.

This generating capacity of which you speak includes hydraulic capacity for which there is no water (during the seasonal peak load); obsolete hydraulic capacity for which there is no water at any time, such as the Adams station of the Niagara Falls Power Company; obsolete steam equipment whose use could only be justified under the most extreme emergency, and steam equipment whose capacity is less than the rated capacity because of limiting conditions of either condensing water or boilers. When this unavailable capacity is deducted and allowance made for spinning reserve it will be found that very little margin exists for load growth.

When cognizance is taken of the fact that it requires from eighteen months to two years to get new steam capacity on the system and when it is appreciated with what rapidity the electrical load in the state of New York is growing, it can be understood why the Niagara Hudson Power Corporation, through its subsidiary, the Central New York Power Corporation, is rushing to completion the first unit of a 400,000-kw. steam station at Oswego. Apparently, the Niagara Hudson engineers are not placing a great deal of reliance upon that 60 per cent of surplus generating capacity of which you speak.

This whole subject of present load, load growth, present capacity and future capacity in the state of New York has been completely analyzed in the Power Authority's Eighth Annual Report, issued May 16, 1939. A copy of this report was sent to your main office

MATTHEWS CONNECTORS

For All Kinds of Wire Connections Without Solder

NUTYPE SERVICE CONNECTORS

For copper to copper—in 12 sizes.

With or without Nut Retainers.

Also available in some sizes for aluminum to aluminum and copper to aluminum connections.

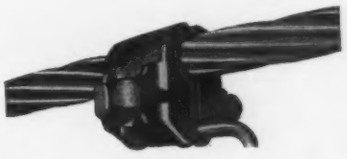
SERVICE ENTRANCE CONNECTORS

A sturdy and economical means for connecting house service or other end to end copper connections (not under tension).

UNIVISE TELEPHONE and small copper wire connector.

Vice type—strong and easily connected or disconnected.

PARALLEL CLAMPS



For connecting small tap off wires to larger main conductors at a saving.

Write for Bulletins and Samples

W. N. MATTHEWS CORPORATION

St. Louis, U. S. A.

1899 to 1939

on or about that date and I am certain that a perusal of the report will lead you to conclusions considerably at variance with those in your editorial. The essential facts of the potential power situation are:

	Kilowatts
By 1950 the combined peak loads of the up-State and metropiltan areas in New York State will total not less than	6,300,000
The dependable capacity of existing hydro developments available for this load totals	900,000
Leaving a balance of	5,400,000
The dependable capacity of the St. Lawrence-Niagara Co-ordination System proposed by the Power Authority, including the first stage of the contemplated development of the Niagara River, will amount to	1,400,000
Leaving a balance for fuel generating capacity of	4,000,000
The necessary supplemental, station service and floating reserve fuel capacity totals	872,000
Making a total requirement for operating fuel capacity at the time of system peaks of	4,872,000
Of existing fuel capacity the amount which can be classified as available for ordinary system operations totals.	2,914,000
Leaving a minimum requirement of new generating capacity to be constructed prior to 1950, over and above the proposed St. Lawrence-Niagara Grid, of.	1,958,000

The technical studies from which these figures are drawn were placed in evidence last June in the hearings before the Federal Power Commission on the Niagara Falls Power Company's application for an amendment to its license. The Power Authority intervened in opposition to the amendment and its evidence and experts were subjected to searching cross-examination by the company's counsel. The record in this case bears directly on the subject of your editorial and you would find little in this record to substantiate the position you take in your editorial.

MAURICE P. DAVIDSON,
Member Power Authority of the State of New York.

[Mr. Davidson's letter was received a month after the editorial appeared and in the meantime we have rechecked our data with the larger New York systems. It is possible, if due allowance is made for auxiliary service and for certain hydro capacity that may not be firm, that the 60 per cent and over excess capacity may be reduced somewhat, but not very much. Moreover, Mr. Davidson seems to have forgotten that peaks are not usually simultaneous and that such a thing as interconnection exists.—EDITORS.]

•

Return on Range and Water Heater Sales

To the Editor of ELECTRICAL WORLD:

I note your editorial "What Does It Cost to Serve Load Classes?" in the October 21 ELECTRICAL WORLD.

In a very recent mail I received "Committee Reports Northwest Electric Light and Power Association, 1938-39." You have undoubtedly received the same report.

From an article on page 90 of this report I have extracted the "arithmetic" and am inclosing the accompanying tabulation. Of course nobody expects this report to be absolutely accurate for any utility, but after allowing for differences in utility structures it still shows that the best return on investment may be had when the range user is also using an off-peak water heater.

MILLARD SEBERF,
Fowler Manufacturing Company,
Portland, Ore.

	Total Demand	Kw.-Hr. Used	Additional Kw.-Hr. for Range	Additional Kw.-Hr. for Water Heater	Total Kw.-Hr.	Additional Revenue from Range	Additional Revenue from Water Heater	Investment	Additional Investment to Serve Range	Additional Investment to Serve Water Heater	Total Investment	Total Revenue	Return on Investment
Customer without range or water heater.	1	900	.....	.....	900	.....	.....	$300.00	.....	.....	$300.00	$24.20	8.06%
Customer with range, no water heater.	1.7	...	1,320	.....	2,220	$26.40	.....	.....	$210.00	.....	$510.00	$50.60	9.2 %
Customer with range and off-peak water heater.	1.7	...	.....	4,800	7,020	.....	$38.40	.....	.....	$30.00	$540.00	$89.00	16.48%

•

Bonneville Buys Easements

Bonneville Administrator Paul J. Raver has directed his staff to purchase easements, instead of property outright, which give the government the right to set poles or structures and string lines, but leave title in the present owner and permit him to continue using the land. This procedure will minimize the removal of property from tax rolls.

SEARCHLIGHT SECTION

(Classified Advertising)

Employment
Business Opportunities
Equipment — Used or Resale

UNDISPLAYED RATE:

10¢ a word, minimum charge $2.00; Positions Wanted ½ the above rate.

DISPLAYED RATE

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

ELECTRICAL ENGINEER WANTED

Electrical Manufacturer has opening in Sales Department, entailing both inside and outside work, for a young electrical engineer who has had a year or two of experience in the Distribution Department of a Power & Light Company. Single man preferred.

P-684, Electrical World
330 West 42nd St., New York City

POSITIONS VACANT

WANTED: Young technical graduates to train for positions as Field Service Engineers for manufacturer of electric pyrometers and automatic control equipment. Requirements include outstanding personality, highest character references, engineering education, electrical, mechanical, chemical or metallurgical plus background of industrial plant earning experience. Excellent opportunities for promotion after substantial period of thorough training. Candidates must be "mechanically inclined" evidencing natural ability for training work in assembly calibration and test laboratories. Marked proficiency also desired for studies in application engineering for adapting automatic control to advanced industrial processes. Individuals will be given special consideration who have worked in instrument maintenance departments in process plants having installations of modern pyrometers. Write stating age, education, experience and salary desired. P-686, Electrical World, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

EXECUTIVES AND TECHNICAL MEN. Contact employers for positions through our confidential and effective methods. We negotiate preliminary overtures. Established 24 years. Inquiries invited. H. H. Harrison, Director, The National Business Bourse, 20 West Jackson Blvd., Chicago.

(Continued on opposite page)

BECOME AN EXPERT METERMAN

Now is the time to plan for the rapidly increasing demands of meter departments.

Central Stations everywhere must have thoroly trained men to efficiently handle meter and instrument work. Whether you have a grade school education or a degree in E.E., you can profit as a meter Specialist.

HOME-STUDY COURSE

Up-to-Date Study Course trains you thoroly at home from mathematics of elemental electricity to full understanding of all types of meters, demand meters, instruments, relays, single and polyphase testing, repairing, calibration, maintenance, etc.

Endorsed by Meter Officials Everywhere.

Low Cost—Easy Terms—Diploma Granted
Write Today for Free Booklet!

Ft. Wayne Correspondence School
Dept. 111 Fort Wayne, Ind.